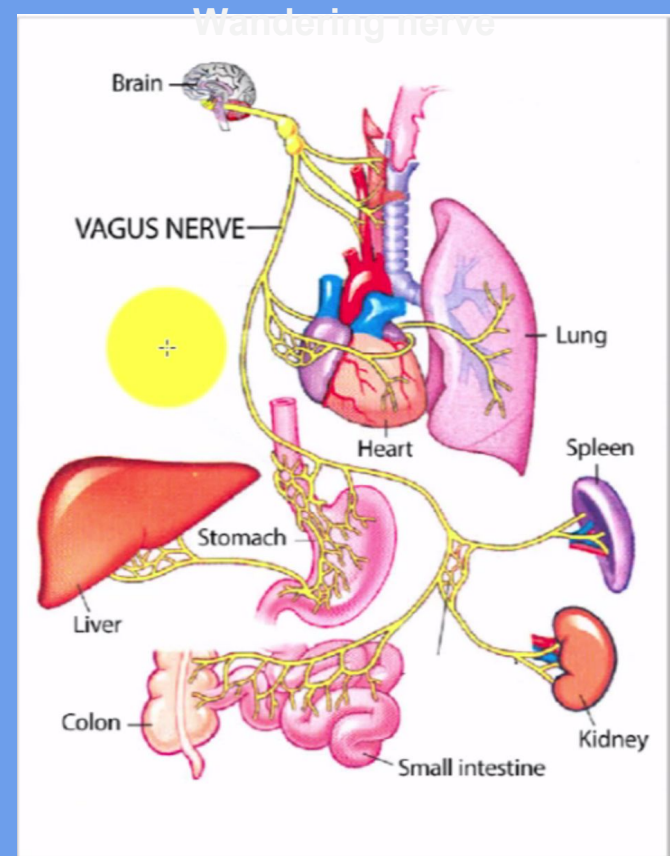
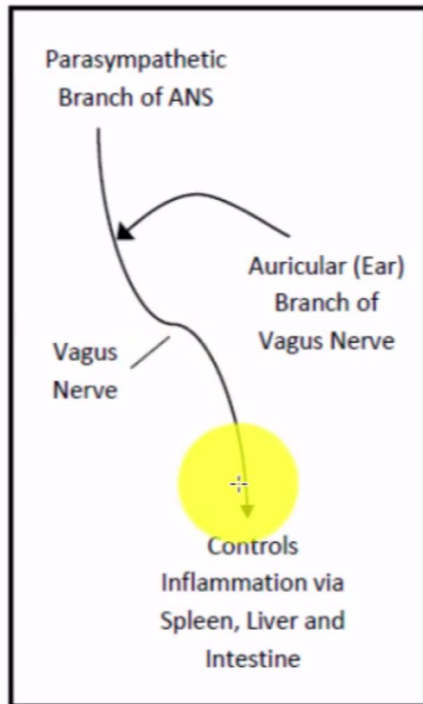


bcst work supports the ANS/Vagus Nerve

Vagus Nerve Stimulation Reduces Metabolic Inflammation



New treatments emerging... that show the power of working with the Vagus nerve

“A woman who suffered from severe, debilitating rheumatoid arthritis received treatment with a device which minimized inflammation by simply stimulating the vagus nerve.

What this means, is that by activating the vagus nerve which is a major part of the parasympathetic nervous system, we can greatly influence inflammation and the immune system. The role of the brain influencing body inflammation can be profound. It can influence digestive complaints, high blood pressure, depression or any inflammatory condition, these are all controlled by the vagus nerve.”



Vagus Nerve Tone Is Key To Activating The Parasympathetic Nervous System

Vagal tone is measured by:

- tracking your heart-rate alongside your breathing rate. Your heart-rate speeds up a little when you breathe in, and slows down a little when you breathe out. ***The bigger the difference between your inhalation heart-rate and your exhalation heart-rate, the higher your vagal tone. Higher vagal tone means that your body can relax faster after stress.***
- High vagal tone improves the function of many body systems, causing better blood sugar regulation, reduced risk of stroke and cardiovascular disease, lower blood pressure, improved digestion via better production of stomach digestive enzymes, and reduced migraines. Higher vagal tone is also associated with better mood, less anxiety and more stress resilience.



The Vagus Nerve Reads The Gut Microbiome!

- By reading the gut biome the vagus nerve initiates a response to ***modulate inflammation based on whether or not it detects pathogenic versus non-pathogenic organisms.*** In this way, the gut microbiome can have an affect on your mood, stress levels and overall inflammation.
- **Low vagal tone** is associated with cardiovascular conditions and strokes, depression, diabetes, chronic fatigue syndrome, cognitive impairment, and much higher rates of inflammatory conditions. Inflammatory conditions include all autoimmune diseases (rheumatoid arthritis, inflammatory bowel disease, endometriosis, autoimmune thyroid conditions, lupus and more).



How do we increase vagal tone?

Vagal tone can be increased through regular practice. To some degree, you are genetically predisposed to varying levels of vagal tone, but this doesn't mean that you can't change it. Here are some ways to increase the tone of the vagus nerve:

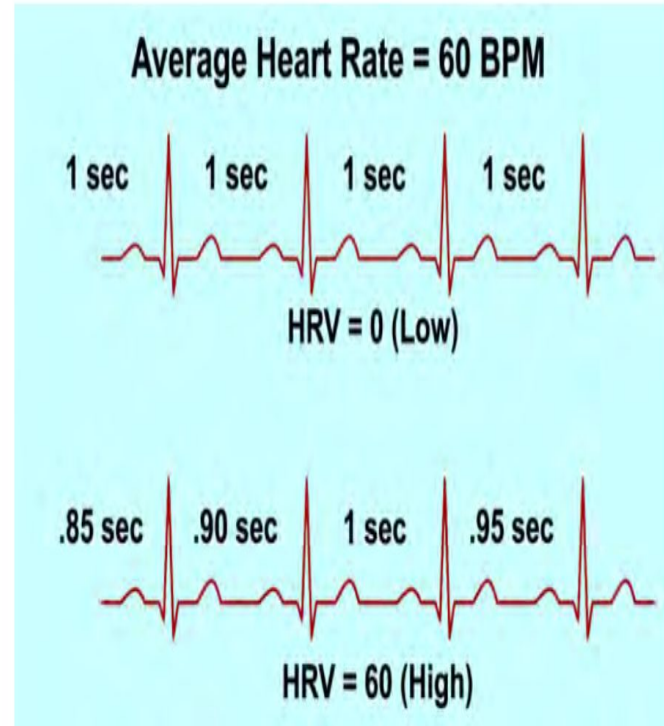
1. Slow, rhythmic, diaphragmatic breathing. Breathing from your belly, rather than shallowly from the top of the lungs
2. Humming, singing, and speaking because the vagus nerve is connected to the vocal cords, You can hum a song, or even better repeat the sound 'OM'.
3. Washing your face with cold water. The mechanism here is not known, but cold water on your face stimulates the vagus nerve.
4. Loving kindness meditation promotes feelings of goodwill towards yourself and others. For example META...
5. Balancing the gut microbiome. The presence of healthy bacteria in the gut creates a positive feedback loop through the vagus nerve, increasing its tone.

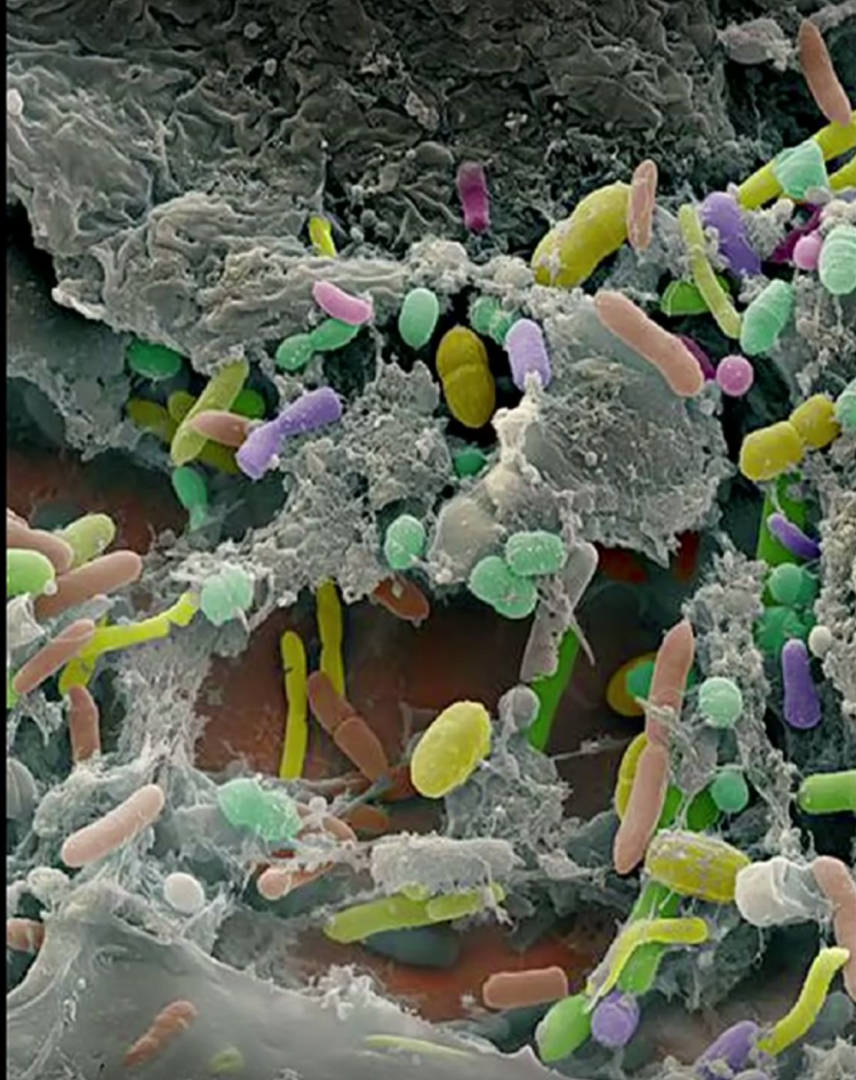


Another way to measure vagal tone...

- Vagal tone measured by heart rate variability
- Solitary nucleus is in brainstem and is major area for vagus nerve
- Autoimmune = pathogen triggering immune sx reactivity
- Autoinflammatory = ongoing inflammation process is triggered w/o pathogen
- We can self treat with a Heartmath device

Figure 1. The higher the HRV, the greater your resilience and the lower your stress.





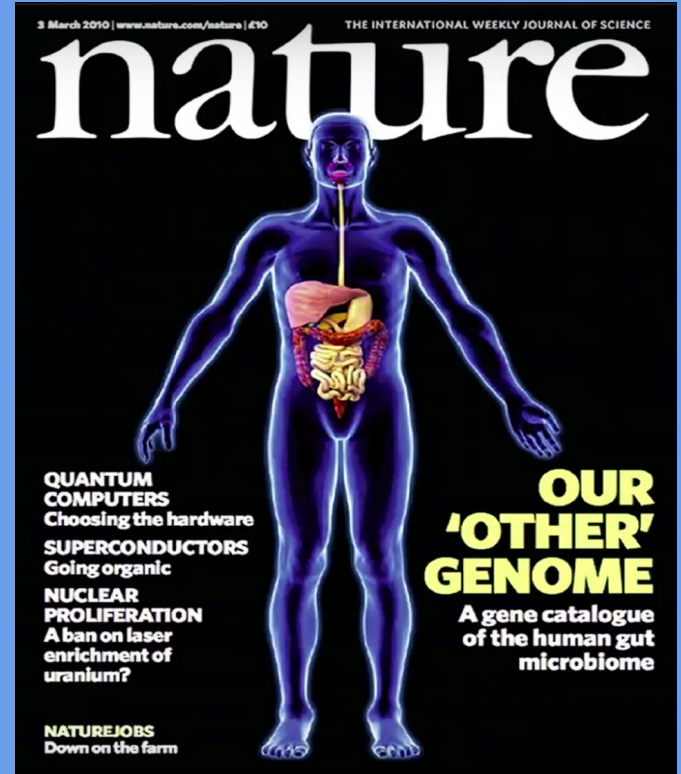
Your flora is your friend

- Food digestion
- Protection against pathogens
- Provides essential nutrients (e.g. vitamins)
- 'Trains' your immune system
- *Disturbance* of flora is linked to disease

Our Microbiome = we live in a symbiotic relationship with bugs; we are ostensibly a community supporting each other

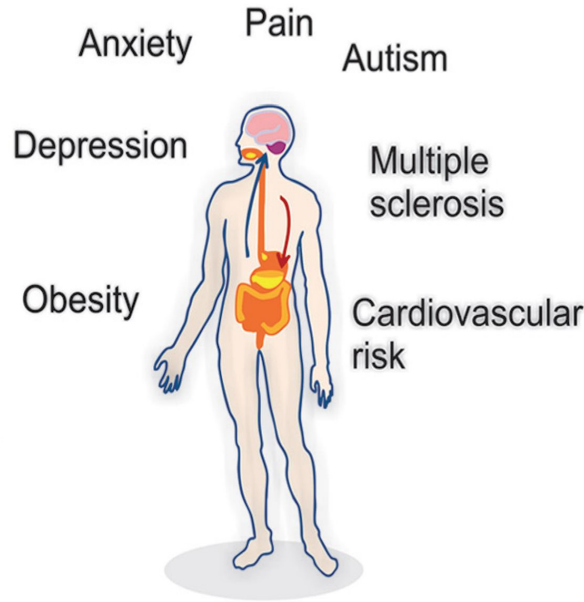
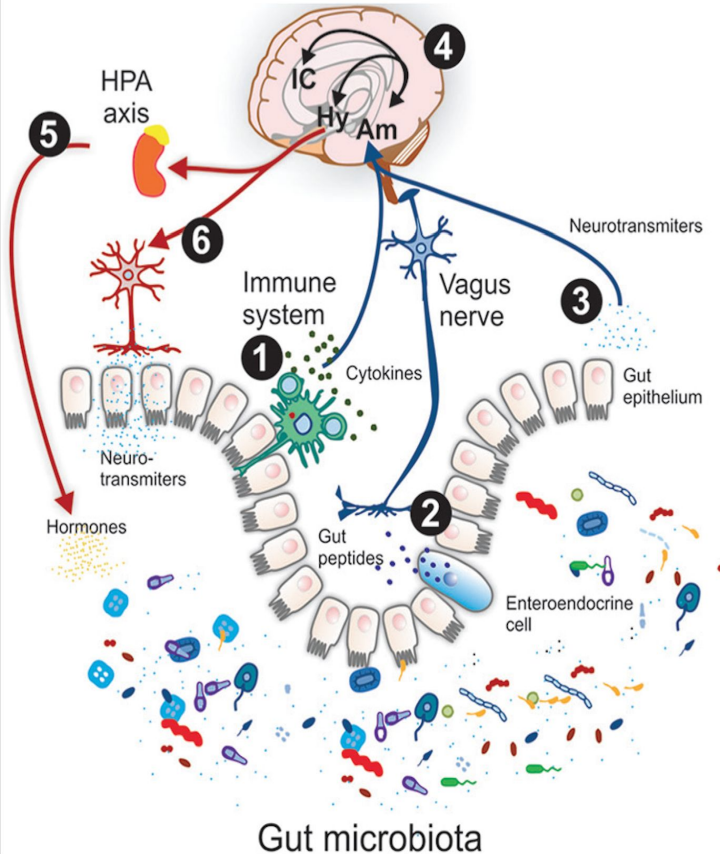
- **Our microbiome...**

- Is inhabited by 100 trillion microorganisms
- This is 10x the number of cells in the human body
- Has 150x as many genes than we have
- Co-exists with gut pathogens
- Regulates the immune system
- Regulates the endocrine system
- Modulates digestion (Vitamin K2, single chain fatty acids, and fructose)
- Weighs 2-6 pounds



Gut/Brain is Bidirectional

Blue= afferent, Red= Efferent

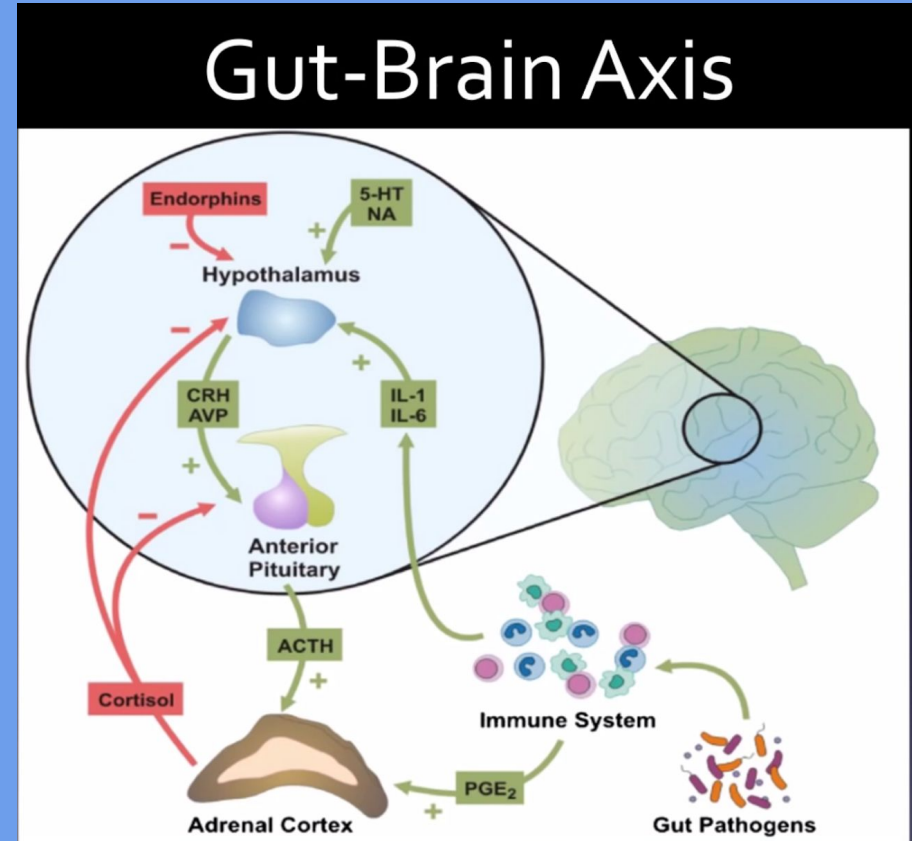


1. Immune system= via endocrine/cytokines
2. Neural Sensory (primarily Vagus Nerve)
3. Neurotransmitters made by microbiome =endocrine to brain
4. Solitary Nucleus brainstem + amygdala (Am), Insular Cortex (Ic), Hypothalamus (Hy)
5. Corticosteroids via HPA axis affect Microbiome
6. The cholinergic anti-inflammatory pathway.Efferent activity of the vagus nerve leads to acetylcholine (ACh) release in organs

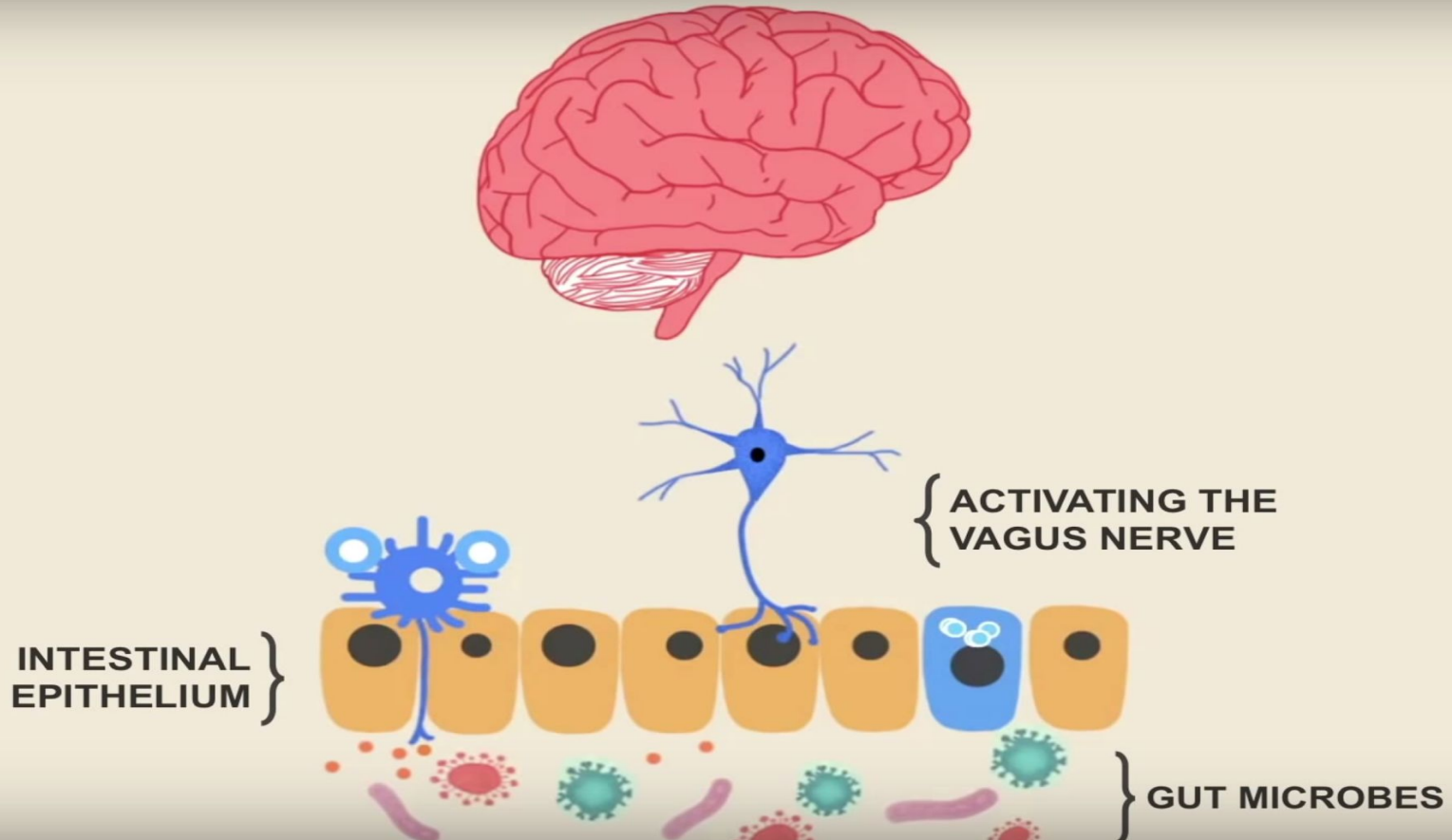


Communication with the Gut Brain Axis is Bi-directional

- ENDOCRINE CONNECTION
 - Take a mouse away from its mother, the gut flora is altered in the baby mouse
 - Stress and sleep deprivation are known to increase cortisol which causes overgrowth of bad bacteria
 - Overgrowth of gut pathogens triggers the immune system to release cortisol, and prostaglandins

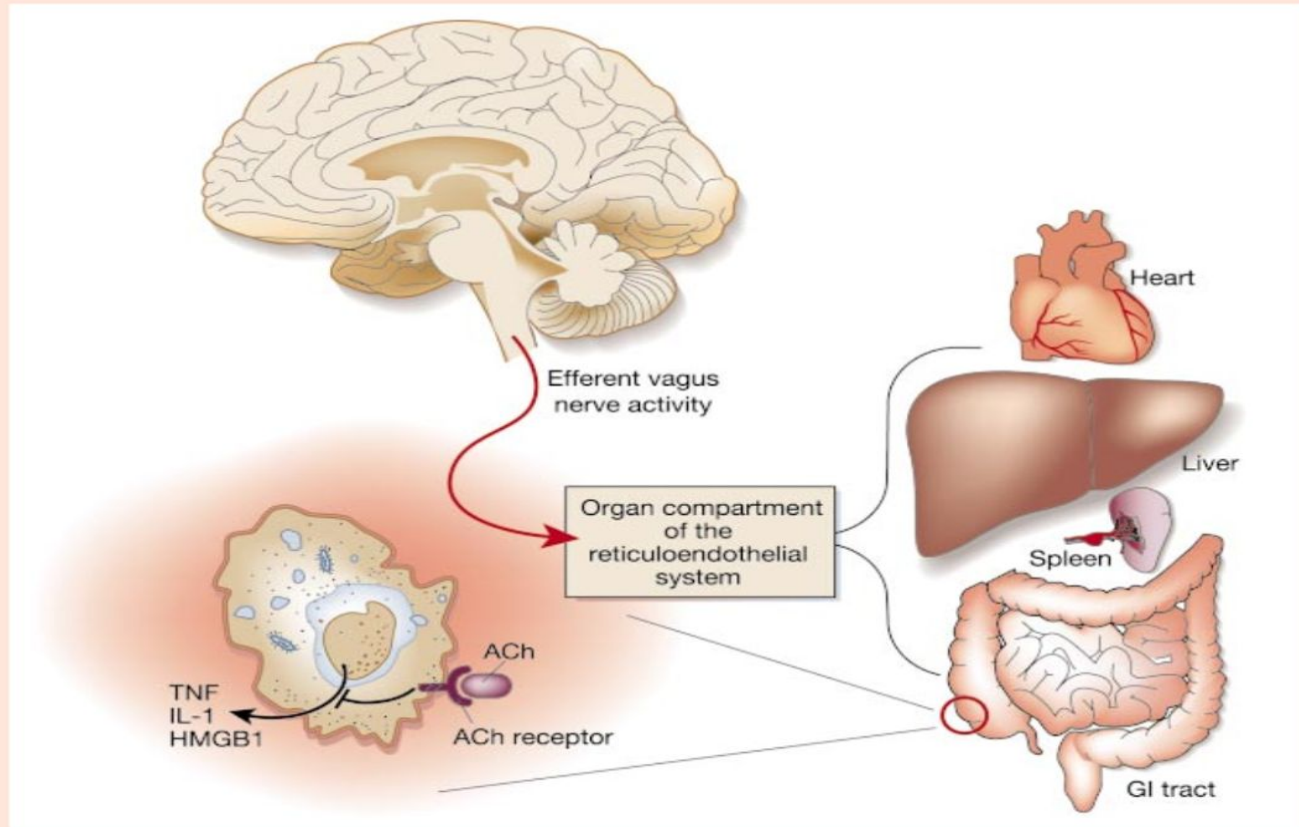


Sensory Neural Connection of Gut Brain Axis



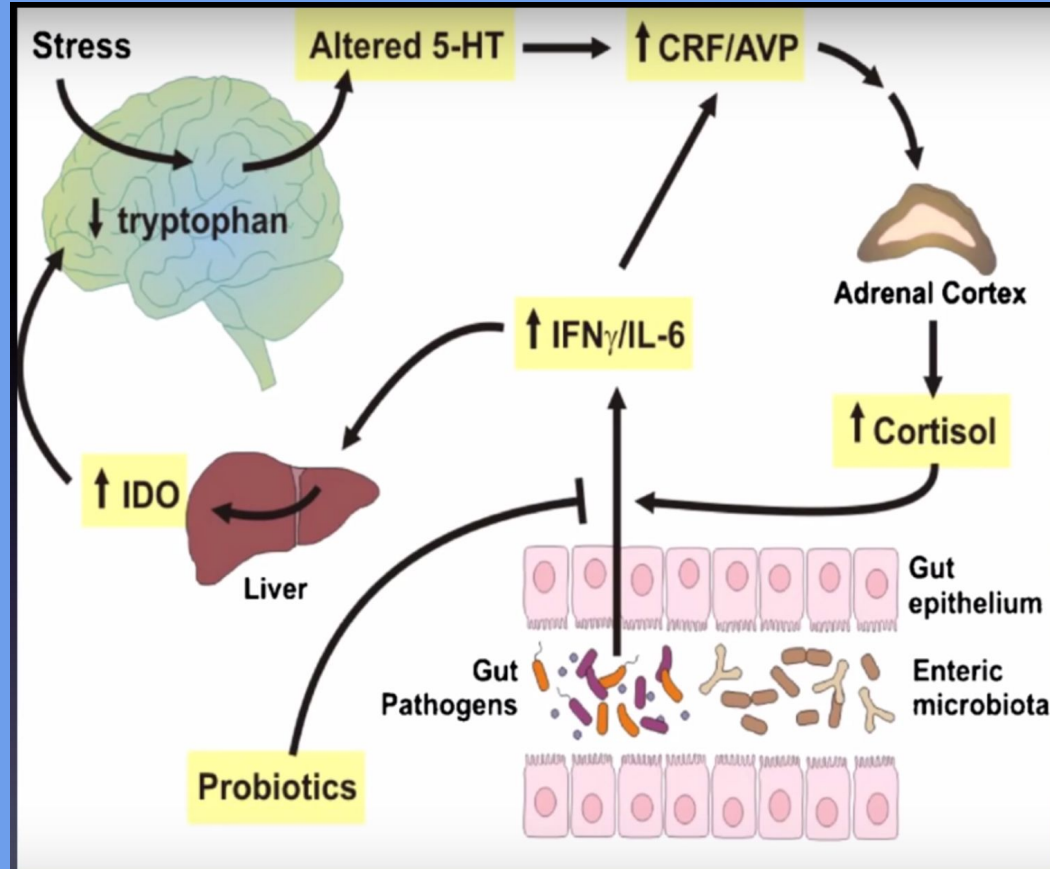
Motor Neural/Vagus Connection from Brain to Gut

Figure 1 The cholinergic anti-inflammatory pathway. Efferent activity in the vagus nerve leads to acetylcholine (ACh) release in organs of the reticuloendothelial system, including the liver, heart, spleen and gastrointestinal tract. Acetylcholine interacts with α -bungarotoxin-sensitive nicotinic receptors (ACh receptor) on tissue macrophages, which inhibit the release of TNF, IL-1, HMGB1 and other cytokines.

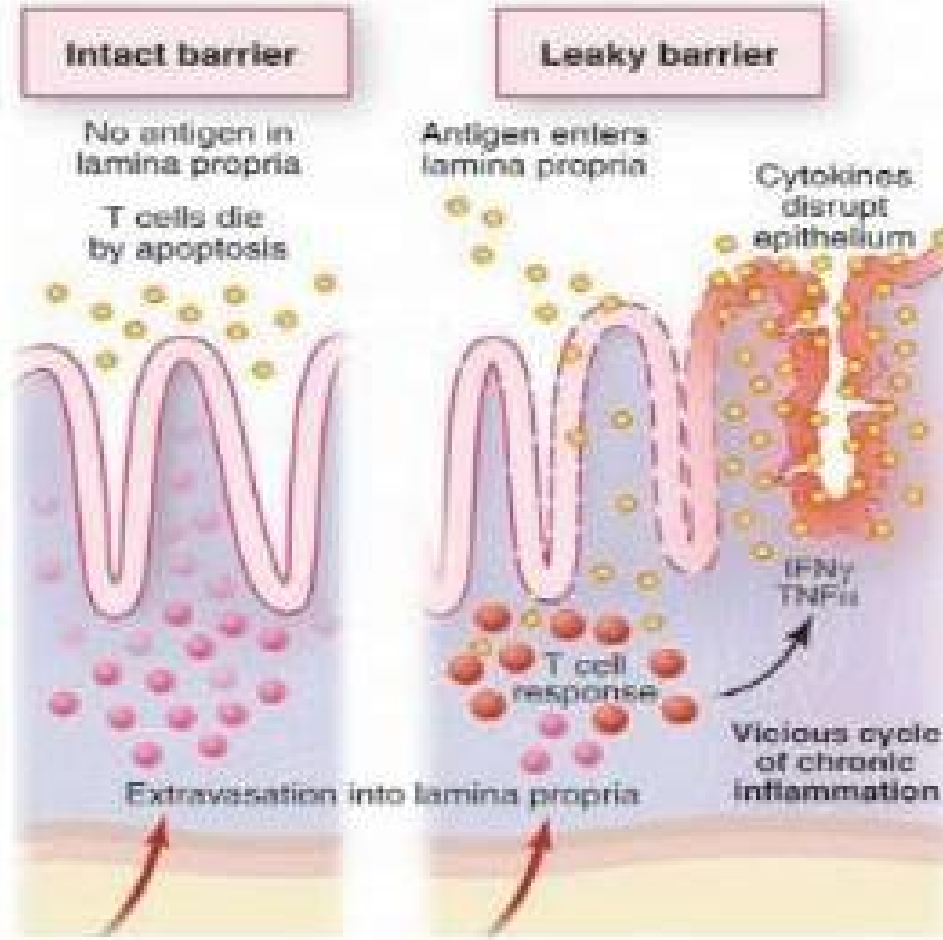
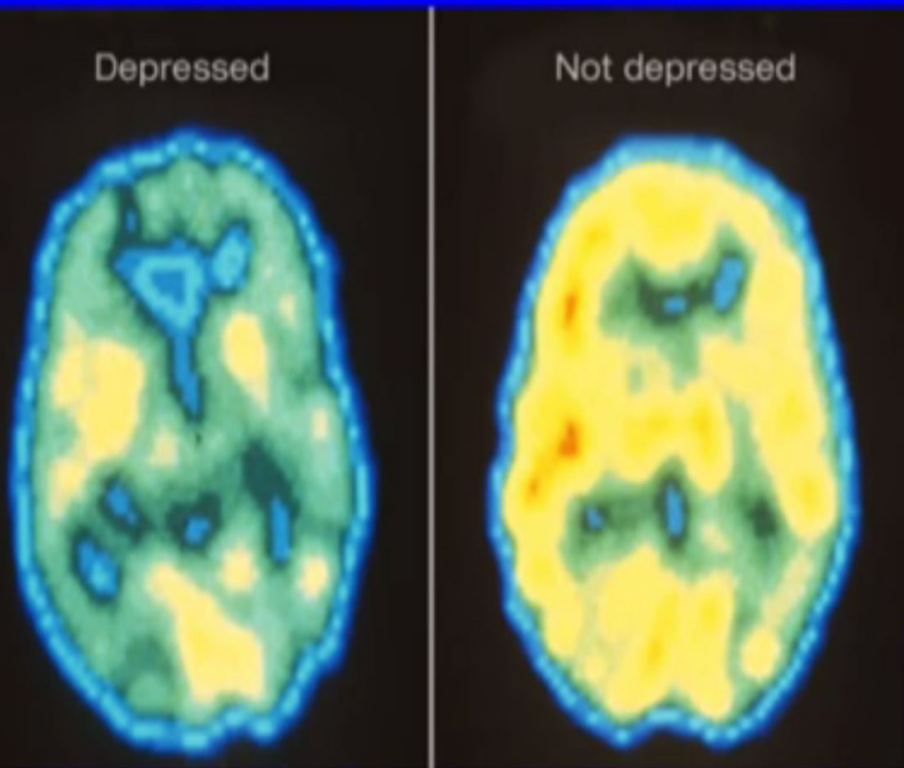


Gut Pathology is linked with Brain Pathology

- Anxiety and depressive disorders linked with autoimmune disease
 - Irritable bowel syndrome is linked with anxiety/depression
 - Schizophrenia is linked with celiac disease
 - Autism spectrum is linked with gut pathology (clostridium, and abnormal levels of gut bacteria)
- Probiotics stop this!
- Germ free mice have too much myelin in their prefrontal cortex. Myelin irregularities are associated with schizophrenia. This was reversed in mice with pbx given



Leaky Gut= Depression
= Inflammation
Dead Bacteria=LPS=Toxic



Leaky Gut Progression



Stress



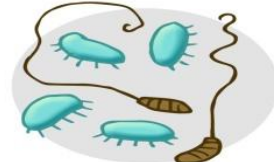
Toxins



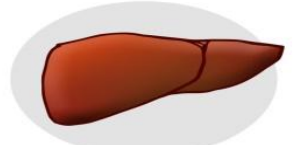
Food Particles



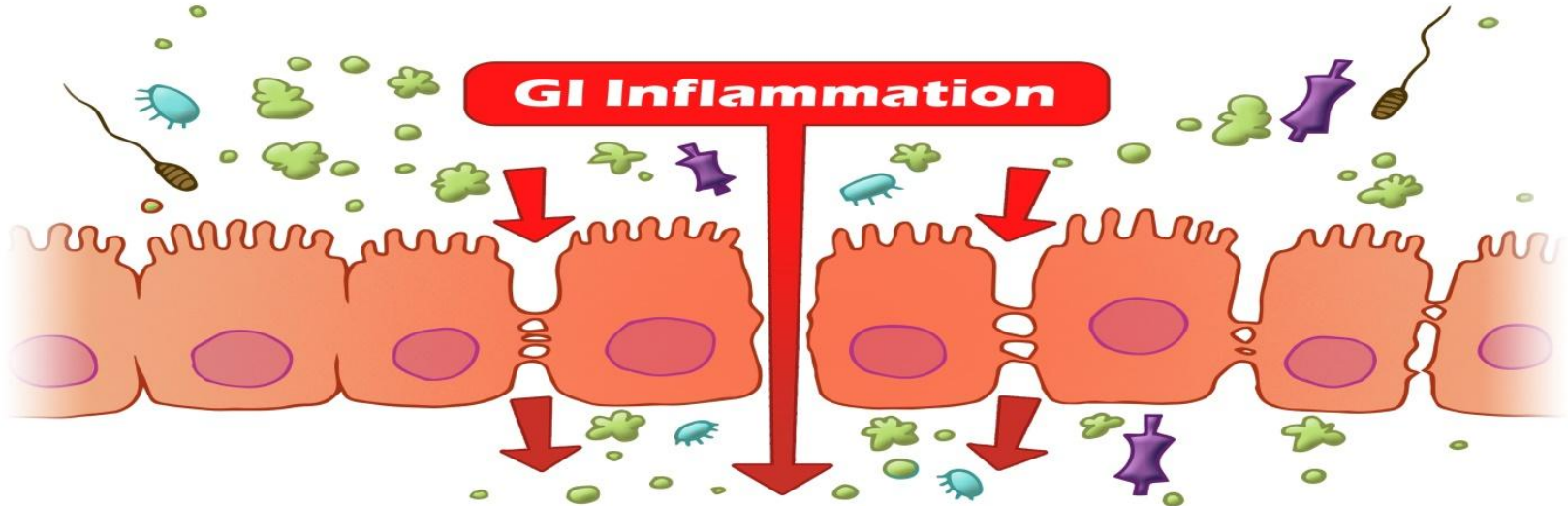
Drugs



Pathogens



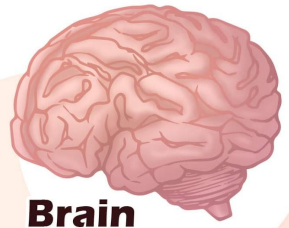
Organ Malfunction



GI Inflammation

Food Intolerances

Immune System Issues



Brain
 Depression
 Anxiety
 ADHD



Sinus and Mouth
 Frequent Colds
 Food Sensitivities

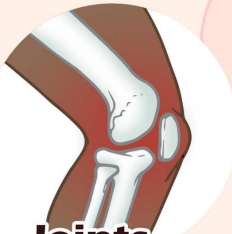


Skin
 Acne
 Rosacea
 Eczema
 Psoriasis

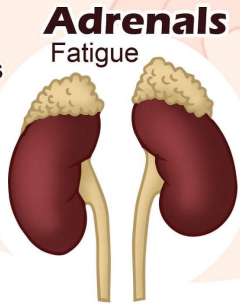


Thyroid
 Hashimotos
 Hypothyroidism
 Graves

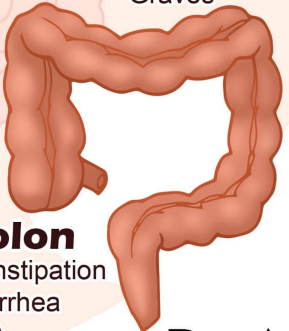
Leaky Gut
Affects the Whole Body



Joints
 Rheumatoid Arthritis
 Fibromyalgia
 Headaches



Adrenals
 Fatigue

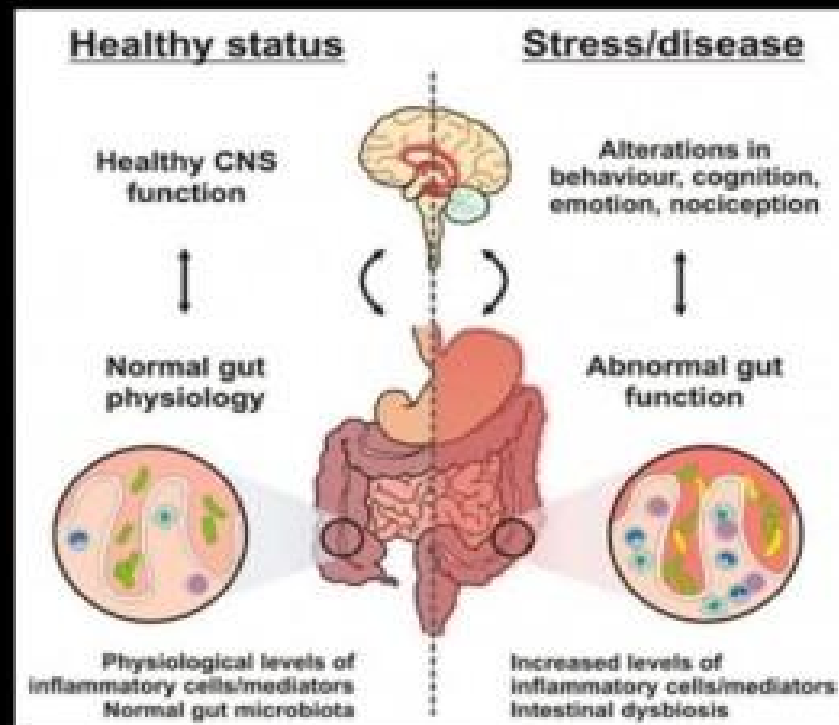


Colon
 Constipation
 Diarrhea
 IBD



Gut/Brain Axis

- Gut injury: Gluten, Glyphosate, Lipopolysaccharides
- Zonulin goes systemic
- Tight junction injury
 - Gut
 - Blood/brain barrier
 - Vascular system
 - Kidney tubules



Zonulin Opens up Barriers...

Top causes of increased zonulin and development of leaky gut:

- Overgrowth of harmful organisms, like bacteria or yeast in the intestine
 - A. SIBO = small intestinal bacterial overgrowth (caused by low HCL, ileocecal valve issues, low enz)
 - B. Fungal dysbiosis or candida overgrowth
 - C. Parasite infections
- Gliadin in the diet (gluten containing foods)
 - Gliadin is a protein in wheat, that like gluten, is a trigger for people with celiac disease. However, a study published in the Scandinavian Journal of Gastroenterology in 2006 clearly showed that gliadin can affect zonulin even in people without the gene for celiac. The researchers concluded that
 - Based on our results, we concluded that gliadin activates zonulin signaling irrespective of the genetic expression of autoimmunity, leading to increased intestinal permeability to macromolecules.

The significance of this is that gluten affects intestinal permeability in all persons to different extents. It also means that 100% of patients with autoimmune disease or leaky gut could potentially benefit from a gluten-free



Elevated zonulin levels and leaky gut are also associated with the following:

1. Crohn's disease
2. Type 1 Diabetes
3. Multiple Sclerosis
4. Asthma
5. Glioma
6. Inflammatory Bowel Disease

In conclusion the article states:

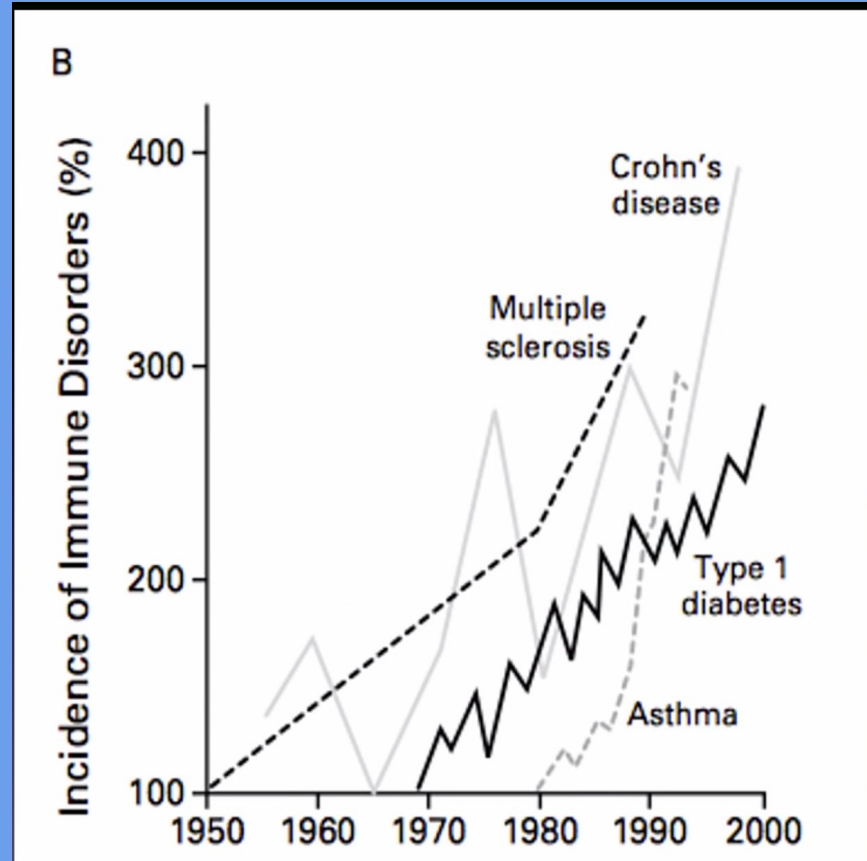
Genetic predisposition, miscommunication between innate and adaptive immunity, exposure to environmental triggers, and loss of intestinal barrier function secondary to the activation of the zonulin pathway by food-derived environmental triggers or changes in gut microbiota all seem to be key ingredients involved in the pathogenesis of inflammation, autoimmunity, and cancer. This new theory implies that [once this path is activated] it can be... reversed by preventing the continuous interplay between genes and the environment.

Zonulin and Its Regulation of Intestinal Barrier Function: The Biological Door to Inflammation, Autoimmunity, and Cancer




What is going on nowadays that is different???

- Toxins
- Too much sugar in mainstream diet
- Too many antibiotics, and given too young= leaky gut
- C-Sections, no breast feeding, no skin to skin with parents
- Too many medications= leaky gut
- Low fat diets
- Amalgam fillings
- Genetically Modified Foods= leaky gut
- Poor methylation= epigenetics



Altering the flora in early life can lead to disease

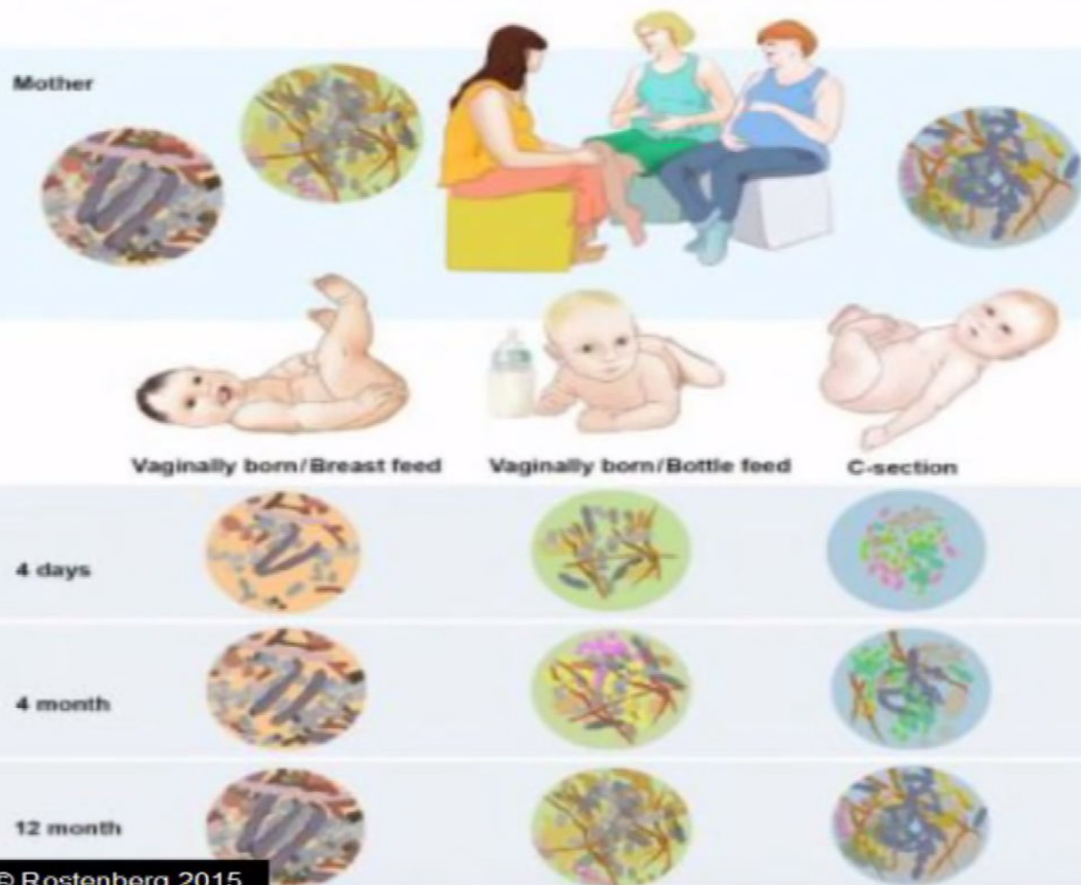


Fecal Microflora in Healthy Infants Born by Different Methods of Delivery: Permanent Changes in Intestinal Flora After Cesarean Delivery

Antibiotics in early life alter the murine colonic microbiome and adiposity

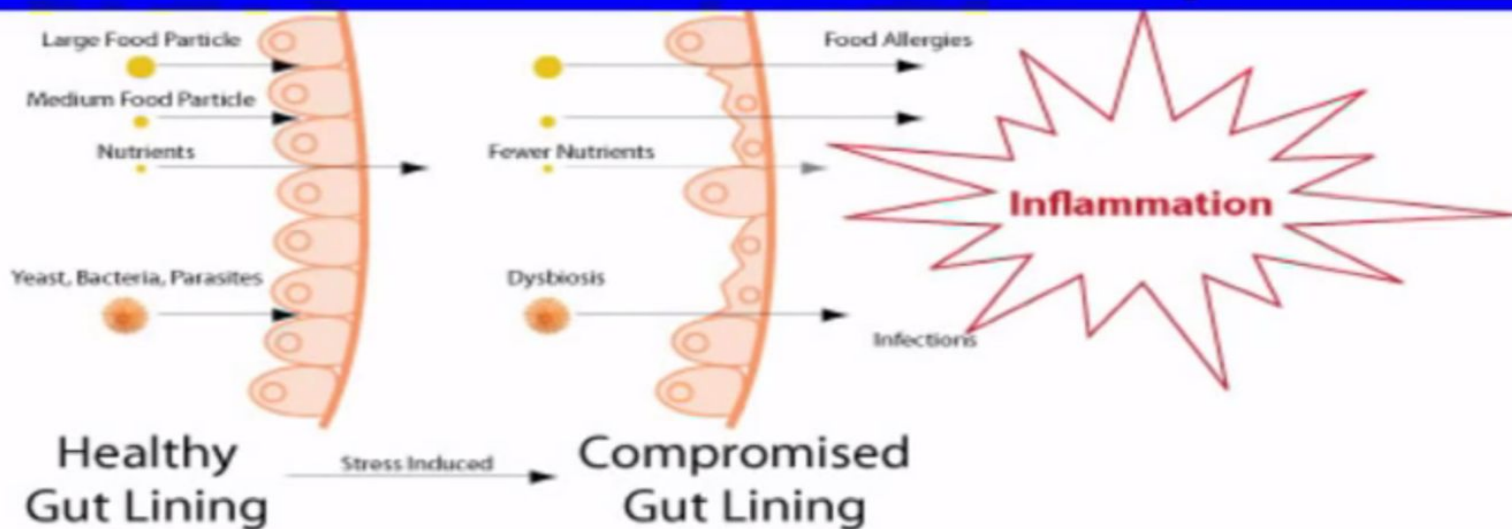
Early life antibiotic-driven changes in microbiota enhance susceptibility to allergic asthma

Gut Microbiome Mother Baby



A fecal sample analysis of 98 Swedish infants over the first year of life found a connection between the development of a child's gut microbiome and the way he or she is delivered. **Babies born via C-section had gut bacteria that showed significantly less resemblance to their mothers compared to those that were delivered vaginally.**

Stress Hormones Cause Leaky Gut



Stress deteriorates the gastrointestinal lining over time causing Leaky Gut. This triggers additional food allergies and inflammation.

Only at the site of PPs where IgA-producing plasma cells are most numerous (the dome) was a decrease found in this type of cell. These effects were due at least in part to the effect of glucocorticoids and catecholamines. Since IgA produced in PPs is a natural antibody that impedes bacterial infections, repeated stress may favor the entry of pathogens through the intestine.

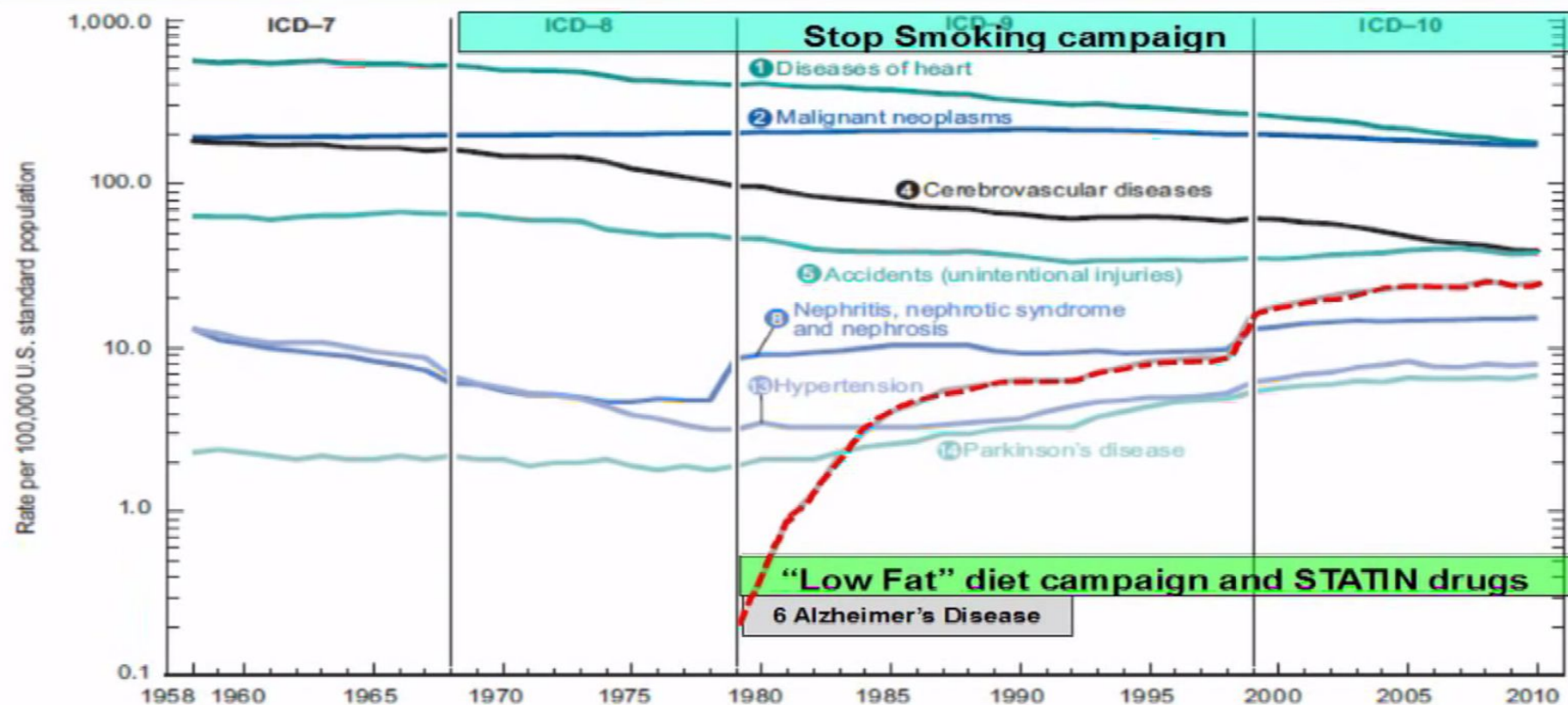
Antibiotics Increase Childhood Obesity by 50%



Antibiotics during the first 6 months of life led to increased risk of overweight among children of normal weight mothers (OR: 1.54,



Low Fat Diets, Drugs Increasing Dementia



NOTES: ICD is the *International Classification of Diseases*. Circled numbers indicate ranking of conditions as leading causes of death in 2010. Rates for 2001–2009 are revised using updated intercensal estimates and may differ from rates previously published; see Technical Notes.

SOURCE: CDC/NCHS, National Vital Statistics System, Mortality.

Figure 6. Age-adjusted death rates for selected leading causes of death: United States, 1958–2010

Glyphosate/Roundup destroys shikimate pathway

*Tyrosine makes Dopamine

*Tryptophan makes Serotonin

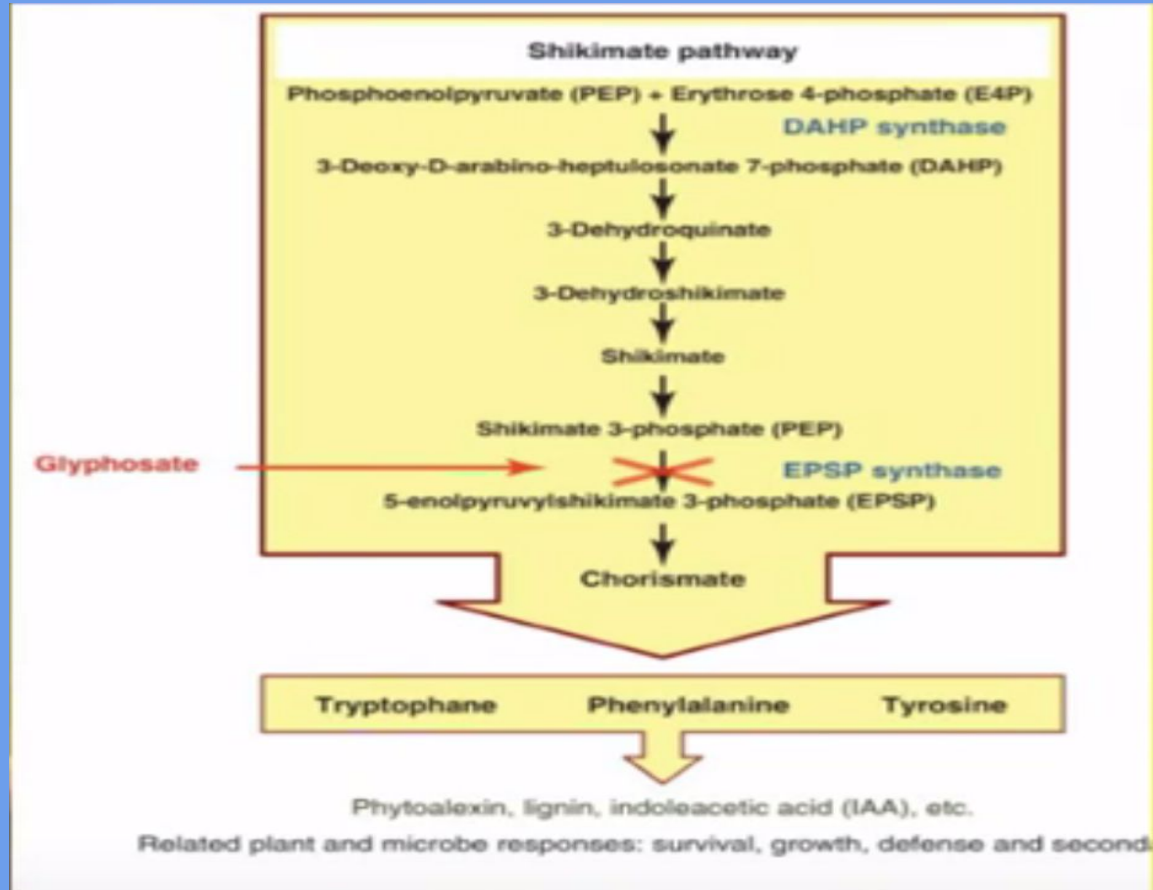
*Phenylalanine makes Tyrosine which makes Dopamine, Norepinephrine, and epinephrine

Different Gut Bacteria make Tryptophan:

Proteobacteria, Actinbacteria, Firmicutes

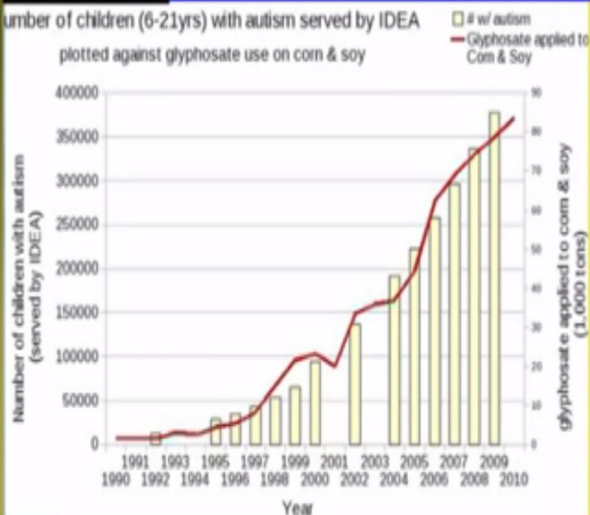
E.Coli makes Chlorismate

© No amino acid=biome dies



Glyphosate Autism Highly Correlated

© Rostenberg 2015



For over three decades, Stephanie Seneff, PhD, has researched biology and technology, over the years publishing over 170 scholarly peer-reviewed...she took the audience by surprise when she declared, **“At today’s rate, by 2025, one in two children will be autistic.”**

She noted that the side effects of autism closely mimic those of glyphosate toxicity... **including zinc and iron deficiency, low serum sulfate, seizures, and mitochondrial disorder.**

<http://tinyurl.com/q547hzp>



Dr. Stephanie Seneff

GMO Corn Causes Tumors

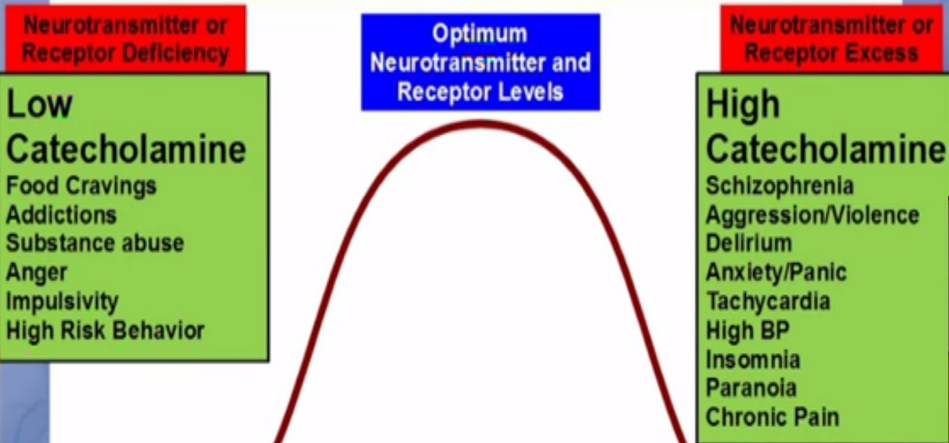


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Rats fed a lifelong diet of one of the bestselling strains of genetically modified corn suffered tumours and multiple organ damage...The first lifetime trials involving rats fed on GM corn found **a raised incidence of breast tumours, liver and kidney damage.**

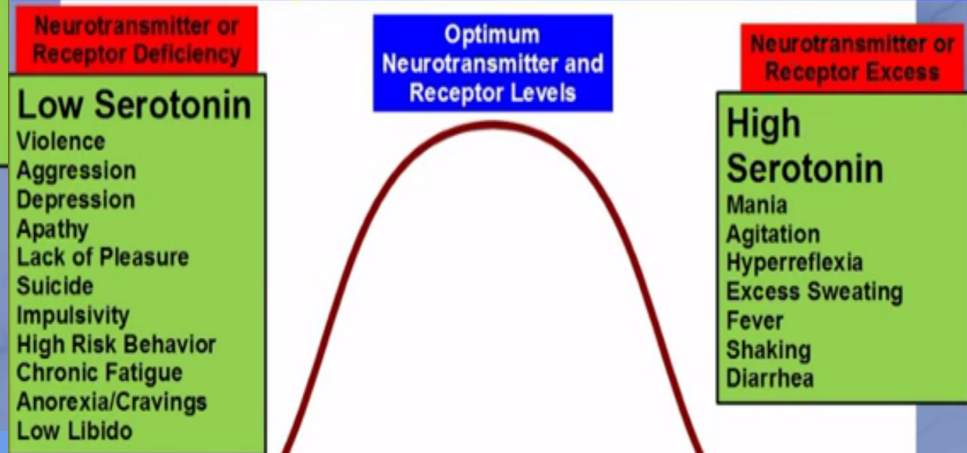
<http://www.dailymail.co.uk/sciencetech/article-2205509/Cancer-row-GM-foods-French-study-claims-did-THIS-rats-cause-organ-damage-early-death-humans.html>

Catecholamine/Dopamine Bell Curve

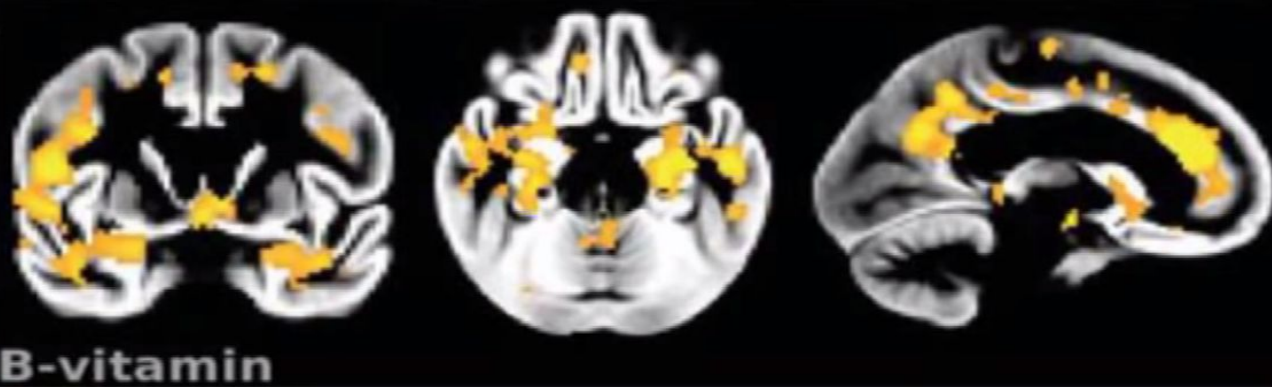


Serotonin Bell Curve

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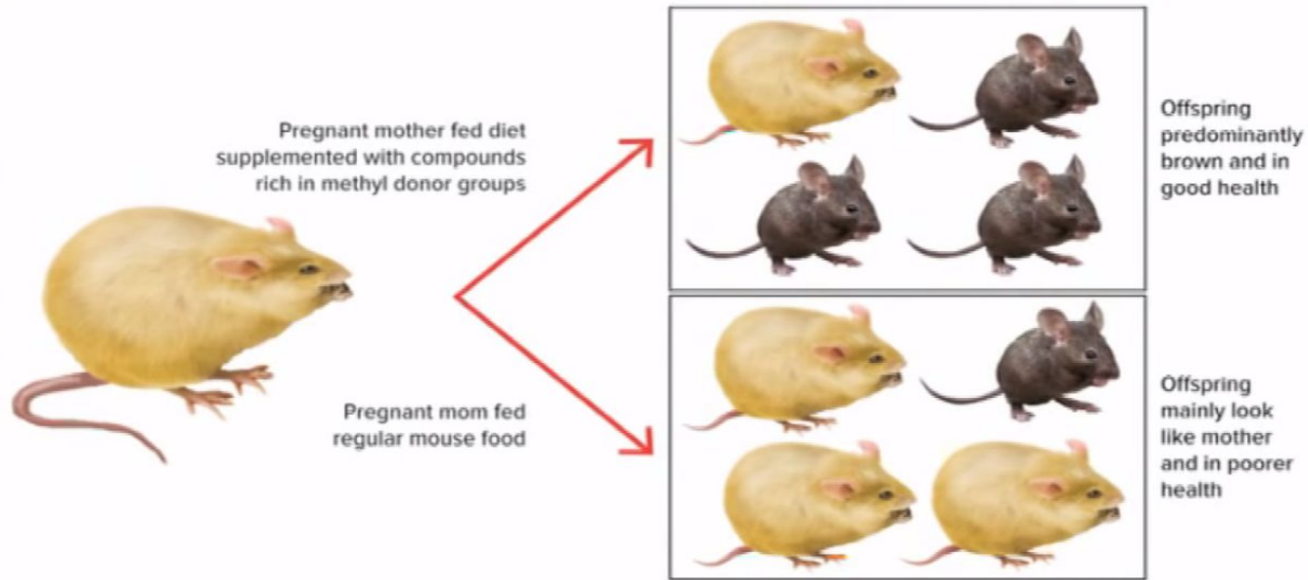


Methylation Vitamins Preserve Grey Matter



B vitamins lower homocysteine, which directly leads to a decrease in GM atrophy, thereby slowing cognitive decline. Our results show that B-vitamin supplementation can slow the atrophy of specific brain regions that are a key component of the AD process and that are associated with cognitive decline.

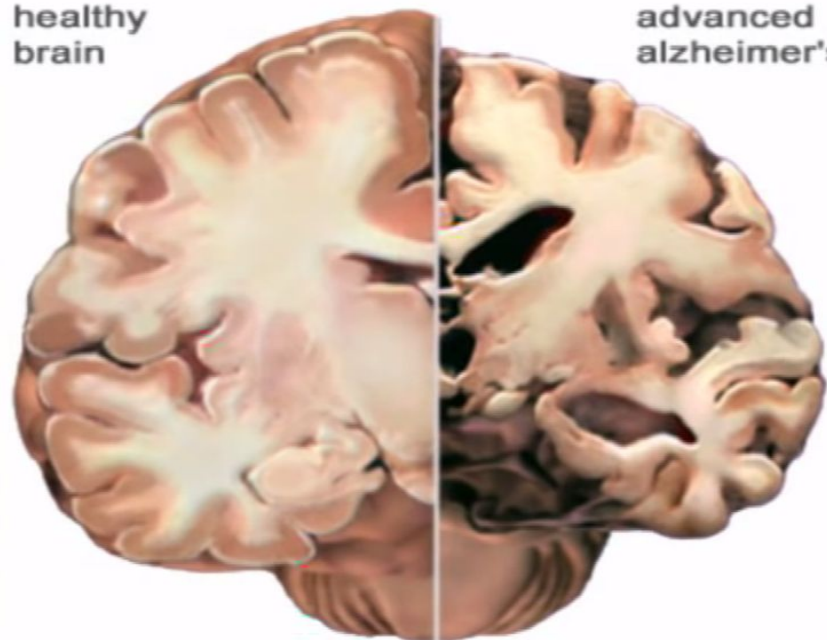
B-Vitamins and Phytoestrogens Protect DNA



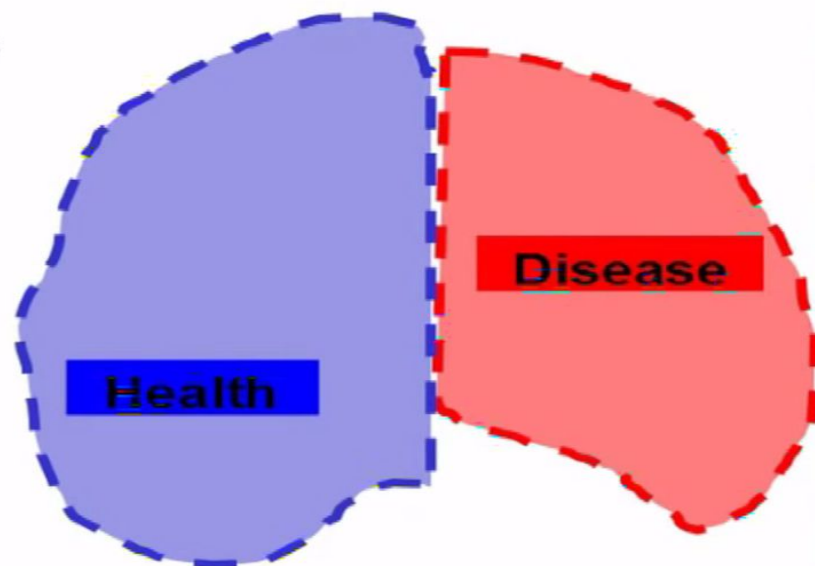
Moreover, the BPA-induced hypomethylation of the fetal epigenome was abolished by maternal dietary nutritional supplementation with either methyl donors (folic acid, betaine, vitamin B12, and choline) or the phytoestrogen genistein. These findings demonstrate that simple dietary changes can protect against the deleterious effects of environmental toxicants on the fetal epigenome.

Toxins Can Increase Dementia, Degeneration, Cognitive Impairment

healthy
brain



advanced
alzheimer's



Health

Disease

In most of the studies plasma homocysteine levels significantly correlated with cognitive functions, dementia and markers of neurodegeneration in PD patients

More Facts

- Gut bacteria given to a germ free mouse from a heavy mouse made the germ free mouse heavy. Same thing happened with a thin mouse gave a germ free mouse their microbiome it caused them to be thin.
- Mice raised in a germ free environment when given specific bacteria and it was found to change their behaviour
- Low Serotonin and High Dopamine is a recipe for violence and aggression
- 50% of all norepinephrine/noradrenalin is synthesized and used in the Gut
- Stress hormones cause rapid growth (4X) of pathogen e. Coli
- Bacteria steal Iron to grow rapidly, and can cause Iron deficient anemia
- Adrenalin Increases biofilm formation, Biofilm is what 90% of bacteria live in
- Bad bugs eat sugar and refined carbs
- Antibiotics kill good bacteria as well as bad bacteria and upset the gut balance
- 25% women from 40-60 years old are on antidepressants



Wrapping it all Up... What Have We Learned?

Brain health depends on a healthy gut environment

Many symptoms we experience daily in our heads, are in fact due to problems in our guts

Modern lifestyle and medical practices have greatly harmed our microbiome

GMO foods interfere with our gut bacteria's ability to produce neurotransmitters

Inflammation from leaky gut destroys serotonin, leading to insomnia, pain, anxiety, worry and excess stress

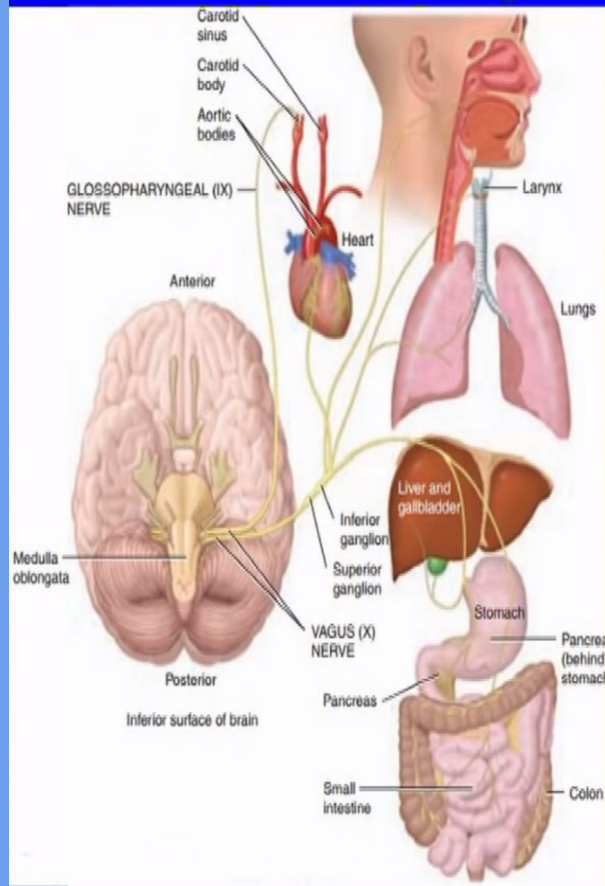
Overuse of antibiotics, poor stomach function, and lack of gut motility creates Small Intestine Bacterial Overgrowth

Lactobacillus REDUCES Anxiety via GABA and Vagus Nerve

© Rostenberg 2015

GABA

is an amino acid which acts as a **neurotransmitter** in the central nervous system. It inhibits nerve transmission in the brain, calming nervous activity.



Alterations in central GABA receptor expression are implicated in the pathogenesis of anxiety and depression... treatment with *L. rhamnosus* (JB-1) induced region-dependent alterations in GABAB1b mRNA in the brain... Importantly, *L. rhamnosus* (JB-1) reduced stress-induced corticosterone and anxiety- and depression-related behavior. Moreover, the neurochemical and behavioral effects were not found in vagotomized mice, identifying the vagus as a major modulatory constitutive communication pathway between the bacteria exposed to the gut and the brain.



What we can do to support our gut brain axis...

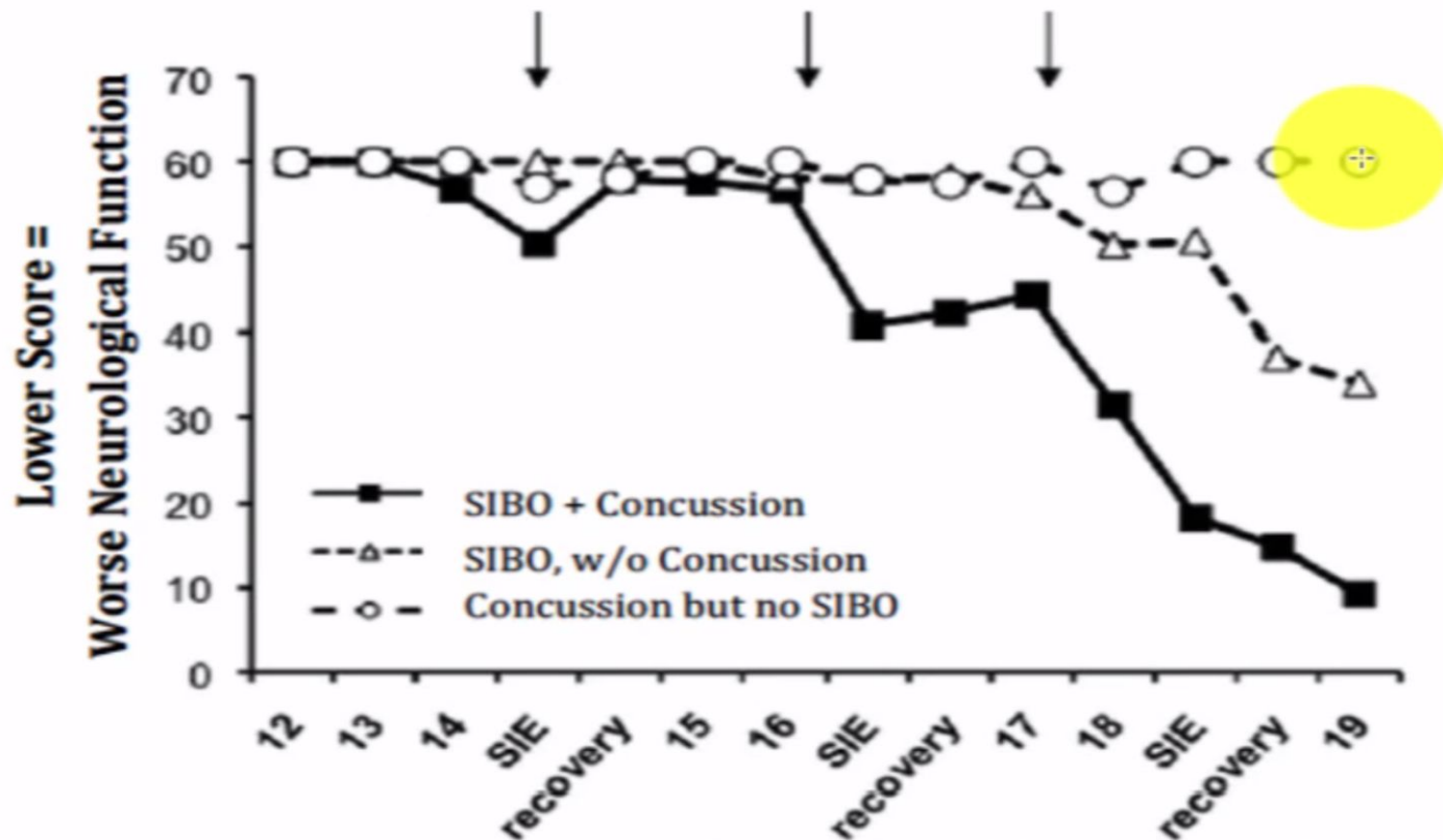
- Probiotics lower anxiety, and increase learning Lower your stress level with our work and a mind-body daily practice
- Eat fermented food if you don't have histamine issues
- Take probiotics, and prebiotics, switch brands often...
- Eat whole unrefined organic foods, grass fed meats, and free range poultry
- Drink bone broth to heal and support your gut walls
- Eat fiber to feed healthy bacteria: psyllium, acacia, inulin= fibers from fruits and some healthy carbs, cooked cold sushi rice, unripe bananas, cooked cold potatoes
- Avoid too much alcohol, NSAID's (=cause leaky gut) , stress, and sleep loss
- Low carb diets to avoid feeding bad bacteria
- See a natural health doctor for help is there is an overgrowth in the gut
- Get muscle tested for food sensitivities: gluten, dairy, corn, soy are m/c



What bacteria produce which neurotransmitter?

- Lactobacillus and Bifidobacterium species produce GABA
- Lactobacillus produces Acetylcholine
- Escherichia, Bacillus, and Saccharomyces produce norepinephrine
- Candida, Streptococcus, Escherichia, and Enterococcus produce serotonin
- Bacillus and Serratia produce dopamine

Physical, Emotional or Inflammatory Concussions



Adapted from Cunningham 2013

Reference articles

- <http://www.mindful.org/meet-your-second-brain-the-gut/>
- <http://neurosciencenews.com/parkinsons-gastrointestinal-tract-neurology-2150/>
- <https://bbrfoundation.org/brain-matters-discoveries/gut-bacteria%E2%80%99s-vital-role-in-prefrontal-cortex-brain%E2%80%99s-white-matter>
- <http://primaldocs.com/members-blog/zonulin-leaky-gut/#!prettyPhoto>
- <http://doctorakil.com/microbiome/>
- <http://drhyman.com/blog/2016/09/08/do-probiotics-really-work/>
- Dr. Rostenberg, DC
- Dr. Axe
- Dr. Hyman
- <http://science.sciencemag.org/content/341/6150/1241214>

