

Gut-Brain-Microbiome Axis and Its Affect on
Brain and Gut Health
Tourette's Syndrome Conference 2016



Vicki Steine, DSc, LCSW



Professional Background

Vicki Steine is a Doctor of Science in Holistic Nutrition and a Licensed Clinical Social Worker. Her passion is to help her clients gain information on health and wellness. Dr. Vicki combines her skills as a social worker with her dietary knowledge in functional nutrition to educate clients about the benefits of treating mental health and neurological issues with nutrition and supplements. Valuing both traditional and integrative medicine, she is a passionate believer in and teacher of the power of personal responsibility in health and wellness.

Vicki Steine is *not* a physician, nutritionist or dietician. She is a Nutrition Educator providing information to enhance her client's knowledge of how nutritious foods, herbs, supplements, and lifestyle affect health.

Dr. Vicki is currently in private practice at Parkaire Consultants, Marietta, Ga., Amen Clinics, Sandy Springs, Ga., Mind and Motion Developmental Centers and Fresh Start for Your Mind in Alpharetta, Ga.

In addition to her work as a psychotherapist, Dr. Vicki spent eleven years working in the food manufacturing industry at Georgia Spice Company. She held various positions including President, Operations Manager, and Purchasing Agent.

DSM IV (and V)

Dr. Thomas Insel, M.D. the director of the National Institute of Mental Health told Dr. Mark Hyman at a dinner in D.C. his opinion of the DSM IV:

"It has 100 percent accuracy, but 0 percent validity—that it provides a perfect way to describe symptoms but has nothing to tell us about the underlying biology of what causes them."



Hyman, M., M.D. (2010). *The Ultramind Solution*. New York, NY: Scribner.

Functional Nutrition Fundamentals

■ **For untold centuries, humans have relied on the food supply as a source of energy, health, and connection.**

However, in the last six or seven decades, changes in the food supply (and in how we use it) have contributed strongly to the growing epidemic of chronic disease. Functional Nutrition developed out of a desire on the part of healthcare providers to change that picture.

■ **Emerging science is very clear that food is a powerful influence on health.**

Food offers not only the calories that fuel our body's metabolism (engine), but it also contains many diverse components that play important roles in all our bodily functions. Poor-quality food can actually create disease, and high-quality food—in the right proportions and amounts—can reverse disease and sustain health. In a very real sense, food is medicine!

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Functional Nutrition

Is about finding the right way for each of us as individuals to eat

Using food to maximize the potential for health

Helping to reverse dysfunction or disease

Acknowledging that there is no single "right diet"

We must pay attention to our genetic backgrounds, different preferences, and different lives

We want to be healthy—most of us don't know how to use food and dietary patterns to make that happen

Functional Nutrition offers the strategies and tools to make that happen!


Taken from The Institute of Functional Medicine 2014

Nutritional Medicine as Mainstream in Psychiatry

Psychiatry is at an important juncture, with the current pharmacologically focused model having achieved modest benefits in addressing the burden of poor mental health worldwide. Although the determinants of mental health are complex, the emerging and compelling evidence for nutrition as a crucial factor in the high prevalence and incidence of mental disorders suggests that **diet is as important to psychiatry as it is to cardiology, endocrinology, and gastroenterology.**

Evidence is steadily growing for the relation between dietary quality (and potential nutritional deficiencies) and mental health, and for the select use of nutrient-based supplements to address deficiencies, or as monotherapies or augmentation therapies. We present a viewpoint from an international collaboration of academics (members of the International Society for Nutritional Psychiatry Research), in which we provide a context and overview of the current evidence in this emerging field of research, and discuss the future direction. We advocate recognition of diet and nutrition as central determinants of both physical and mental health.

Sarris, J. L., C. A.; Akbaraly, T. et al. (2015). "Nutritional medicine as mainstream in psychiatry." The International Society for Nutritional Psychiatry Research. *Lancet Psychiatry* 2015(January).



Food is Medicine


“Let food be your medicine and medicine be your food.”
- Hippocrates

“The doctor of the future will no longer treat the human frame with drugs but rather will cure and prevent disease with nutrition” -- Thomas Edison, 1902

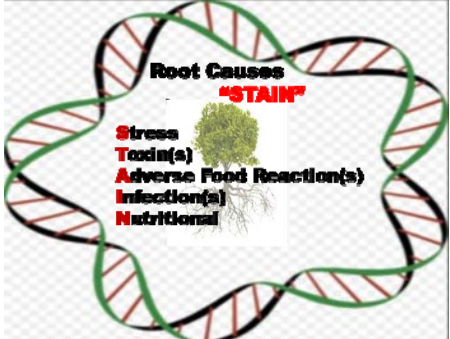
Food is Information




Food is Energy



Food is Connection


Root Causes
"STAIN"

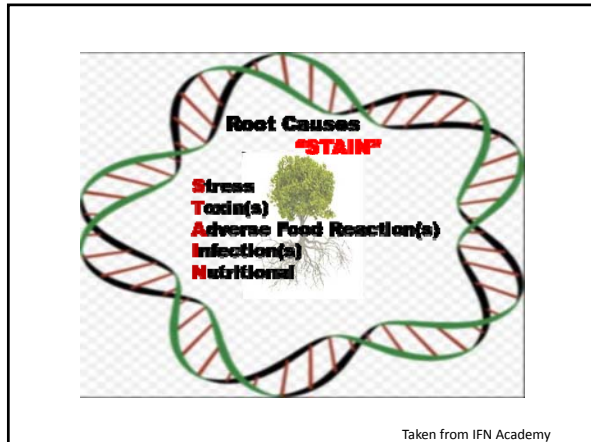
- Stress
- Toxin(s)
- Adverse Food Reaction(s)
- Infection(s)
- Nutritional

Taken from IFN Academy

Stressors of Tourette's Syndrome

- Family
- Friends
- Work/school
- Co-morbid diagnosis
 - OCD
 - ADHD
 - Anxiety
 - Depression
- Others?





Toxins

Exogenous toxins

- Electromagnetic fields
- Traumatic Brain Injury
- Lack of Sleep
Moderate and long term sleep deprivation leads to depression, attention deficit disorders, problems with learning and memory, weight gain
- Sedentary lifestyle
- Drugs-sugar, caffeine, alcohol, nicotine, OTC drugs, prescription meds (side effects and nutrition depletion-Check out Drug-Induced Nutrient Depletion Handbook or chart on-online
<http://www.naturemade.com/~media/images/NatureMade/PDF/Health%20Care%20Professionals/HC%20Updates%20042315/Common%20Drug%20Classes%20and%20Nutrient%20Interactions%20Chart%20FNL.as1x>)

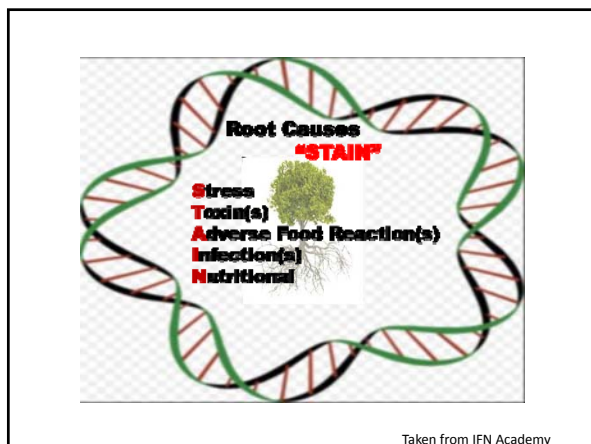
Toxins

- Mold, pollens, food allergies, pesticides, cigarette smoke, perfume, animal dander, dust
- Sugar and High Fructose Corn Syrup
HFCS-more potent than sugar, increases appetite, promotes obesity, and more addictive than cocaine
- Trans or Hydrogenated Fats
Damage cells, increase inflammation, interrupt normal brain function
- Additives
3500 different chemicals added to our food; 3000 in our homes
Hormones, anti-biotics, food chemicals, artificial sweeteners, personal care products, etc.
Harder on children with smaller body weight

Toxins

- Mold
- Metals
Mercury, lead, arsenic, cadmium, aluminum. For example: Mercury toxicity can lead to autism, ADHD, depression, dementia and other symptoms of broken brains. Exposure in the environment, amalgams, vaccines, fish consumption.


Endogenous toxins
The toxins your own system creates from metabolic imbalances metabolism



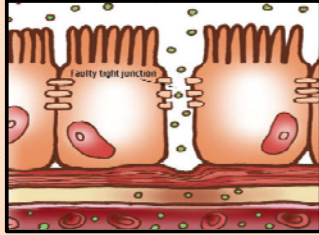
Food Allergies and Food Sensitivities

Food Allergy
Immediate response

Food Sensitivity
Delayed response (up to 72 hours)

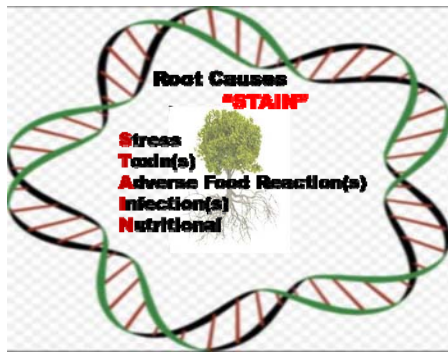


Leaky Gut



Leaky Gut/ Leaky Brain

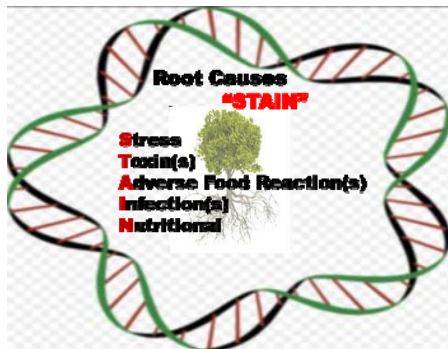
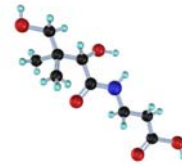
- Depression
- Mood Swings
- Nervousness
- Aggressive behavior
- Fatigue
- Malaise
- Poor memory/concentration
- Confusion
- Schizophrenia
- Food and Environmental Sensitivities



Taken from IFN Academy

Infections

- Small intestinal overgrowth
- Parasites
- Yeast
- Bacteria
- Virus's



Taken from IFN Academy

Where Brain Problems Often Begin



- o Poor digestion
- o Poor gut flora
- o Leaky gut

Taken from Dana Laska presentation at ARI Conference with permission

What is Dysbiosis?

An imbalance in the ratio between healthy bacteria and unhealthy bacteria



Facts About the Gut

- Gut microflora contains potentially beneficial and harmful bacteria
- Microbiota is a unique and vital organ
- Weighs approximately 1.5 pounds
- Metabolic activity rivals the liver
- Is involved in normal central nervous system development

Functional Foods Fact Sheet: Probiotics and Prebiotics (2014), from http://www.foodinsight.org/Functional_Foods_Fact_Sheet_Probiotics_and_Prebiotics

Facts About the Gut

- Helps maintain a healthy intestinal tract
- Helps the intestine act as an effective barrier
- Allows nutrients to be absorbed
- Keeps toxins and pathogens out

Functional Foods Fact Sheet: Probiotics and Prebiotics (2014), from http://www.foodinsight.org/Functional_Foods_Fact_Sheet_Probiotics_and_Prebiotics

Facts About the Gut

- Breaks down vitamins
- Ferments fibers and carbohydrates not digested in the upper GI tract
- Produces fatty acids that are important for supporting a healthy intestinal barrier (particularly in the lower GI tract)
- Inhibits the growth of harmful bacteria
- Healthy intestinal flora is also associated with intestinal (stool) regularity

The Enteric Nervous System

Has more nerve endings in GI than spine

95% of serotonin is made in your gut

All neurotransmitters are made in your gut

Neurotransmitters rely on protein adequacy and the ability to fully digest proteins

90% of neurons in the vagal nerve go from gut to brain

The Human Microbiome Project (HMP)

Microbiome

The population of microbes that live on and in our body

A two part project run by the National Institute of Health (NIH)

HMP's earlier phase (FY2008-FY2012) focused on the composition and genetic potential of the microbiomes across five major regions of the body in healthy American adults and people with skin, GI tract or urogenital tract diseases.



Krishnacreations | Dreamstime.com - Heures Simplex Virus With Human Body Photo

The Human Microbiome Project

The main goal was to determine if the characteristic of microbiomes could be identified for healthy people and for those with specific diseases.

150 healthy people from Houston
 150 healthy people from St. Louis
 Bacteria was taken from 18 sites two to three times over the course of 2 years.



The Human Microbiome Project

Bacteria may be different in the mouth and gut but the communities are predictive of each other

There were strong associations between whether a child had been breastfed, gender, and level of education in several community sites

During the time they took samples, the oral samples were least stable, gut and vagina most stable

The Human Microbiome Project

Your bacteria is uniquely yours

It is like a fingerprint

It is impacted by your life history

Interactions with:
 The environment
 Diet
 Medication



The Human Microbiome Project

Our results demonstrate that even with the considerable intra- and interpersonal variation in the human microbiome, this variation can be partitioned into community types that are predictive of each other and are probably the result of life-history characteristics. Understanding the diversity of community types and the mechanisms that result in an individual having a particular type or changing types, **will allow us to use their community types to assess disease risk and to personalize therapies.**

Ding, T. S., P. . (2014). Dynamics and associations of microbial community types across the human body. *Nature*(15), 357-360. doi: doi:10.1038/nature1317

The Human Microbiome Project

The current phase of HMP (FY2013-FY2015) is studying what the microbiome and the human host are doing and how they respond during three common conditions:

- ❖ Preterm birth
- ❖ Inflammatory bowel disease (IBD) onset
- ❖ Type 2 diabetes onset

The goal is to look for characteristic biological signals which might be associated with the onset of these conditions.

<http://commonfund.nih.gov/hmp/index>

Where do These Bacteria Come From?

Birth Canal

Breast and bottle feeding

General exposure to the environment



Your gut is home to 100 trillion bacterial species

Bacteria outweighs our regular cells 10:1

Research

Bifidobacterium Longum

Researchers found that chronic colitis was associated with anxiety-like behavior in mice.

The anxiety behavior was absent in mice who were vagotomized.

B. Longum normalized anxiety behavior, however, it's anti-anxiety effect was absent in mice that were anxious and vagotomized.

B. Longum also decreased the excitability of the enteric neurons.

Bercik, P., Park, A. J., Sinclair, D., Khoshdel, A., Lu, J., Huang, X., . . . Verdu, E. F. (2011). The anxiolytic effect of Bifidobacterium longum NCC3001 involves vagal pathways for gut-brain communication. *Neurogastroenterology And Motility: The Official Journal Of The European Gastrointestinal Motility Society*, 23(12), 1132-1139. doi: 10.1111/j.1365-2982.2011.01796.x

Digestive Health

What is a Pre-biotic

Prebiotics are defined as “nondigestible food ingredients that beneficially affect the host by selectively stimulating the growth of one or a limited number of bacterial species in the colon, such as Bifidobacteria and Lactobacilli, which have the potential to improve host health.”

Prebiotics are, simply speaking, the “food” for beneficial bacteria.

Functional Foods Fact Sheet: Probiotics and Prebiotics (2014), from http://www.foodinsight.org/functional_foods_fact_sheet_probiotics_and_prebiotics

What is a Pre-biotic

Prebiotics include foods, medicines and dietary supplements. Benefits of the regular consumption of prebiotics include:

- Enhanced immune function
- Improved colonic integrity
- Decreased incidence and duration of intestinal infections
- Down-regulated allergic response
- Improved digestion and elimination
- Improve calcium absorption
- Improve mineral absorption

Sharma, S. A., Nidhi, Verma, Preeti, (June 2012). MIRACULOUS HEALTH BENEFITS OF PREBIOTICS. *International Journal of Pharmaceutical Sciences & Research*, 3(6), 1544. IJF. (2013). What are Fructooligosaccharides and how do they provide digestive, immunity and bone health benefits? Retrieved from <http://www.sciencedaily.com/releases/2013/07/130716115728.htm>

Pre-biotics

Fructooligosaccharides (FOS)/inulin are considered a soluble fiber and a pre-biotic that support the growth of beneficial microorganisms in the intestinal tract while inhibiting the growth of harmful bacteria. FOS provide nourishment to most types of Beneficial Bacteria (because beneficial bacteria are living organisms they require nutrition like any living organism).

****Some research shows FOS can feed “bad bacteria as well”. Try to get FOS from real foods.**

Karr, T., PhD. (2015). Probiotics to the Rescue. Retrieved from <http://www.nanp.org/news/?p=1282>

Pre-biotic Foods

Asparagus
 Jerusalem artichoke
 Banana
 Oatmeal
 Legumes
 Onions
 Garlic
 Honey
 Jicama
 Wheat
 Barley



What is a Probiotic?

In 2001 at a combined conference of the Food and Agriculture Organization and World Health Organization, the term probiotic was defined as: "**live microorganisms which when administered in adequate amounts confer a health benefit on the host.**" At the same meeting, they also determined that certain foods contained probiotics and specific strains were safe for human use. The term probiotic originated from the Greek word meaning "for life".

Probiotics



- Helps lower total serum cholesterol levels
- Produces hydrogen peroxide (which is utilized by the body to "extinguish" neutralized antigen/antibody complexes).

Probiotics



- Ferments insoluble fiber, starch and undigested carbohydrates. The short-chain saturated fatty acids produced by this fermentation are the principal source of energy for the epithelial cells of the colon.

Probiotics

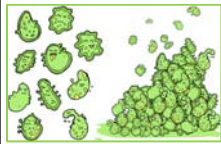


- Manufactures vitamins that not only help with energy and nerve function but are necessary for brain health: Biotin, Choline, Folic Acid, Inositol, PABA (Para Aminobenzoic Acid), Vitamin B2, Vitamin B5, Vitamin B6, and Vitamin K.

Probiotics



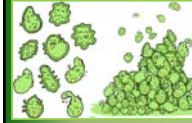
- ❖ Controls epithelial growth (the cells that line the body cavities)
- ❖ Prevents overgrowth of infectious organisms
- ❖ Boosts intestinal immunity
- ❖ Prevents inflammation, diarrhea and other digestive issues
- ❖ Creates a balance between health and disease



Probiotics

Few studies have been conducted on humans.

There are many questions still to be answered regarding children and adolescents particularly at time of brain development.



Benefits of Probiotics Psychobiotics

Studies point to a connection between the brain and gut through the vagus nerve (Cryan, 2014).

Lactobacillus rhamnosus has anti-anxiety effects and works by affecting the GABA receptor sites. In mice studies, when the vagus nerve is cut, administration of this strain has no effect on the receptor site or anxiety (Cryan, 2014).

Some studies are showing certain blends of bacteria can improve depression, anxiety, and how we process emotion (Cryan, 2014)

Where do you Find Good Bugs?



- Kimchi
- Yogurt
- Kombucha

Where do you Find Good Bugs?



- Tempeh (fermented tofu, found in refrigerated section)
- Grass fed cheese-raw or from Europe
- Supplements

Diet that Helps Support the Good Bugs

- Restrict refined carbohydrates
 - White flour and white sugar
- Increase complex carbohydrates
 - Fresh vegetables and fruit
- Fat should be 25-35% of one's diet
 - Healthy fats i.e. nuts, seeds, avocado, coconut oil, olives, olive oil

Probiotic Resource

The Probiotic Advisor

<https://www.probioticadvisor.com/>

- Information on probiotics
- Which strains will help with what illness/disease
- One free day

Supplements



- It is important to purchase a quality probiotic that will
- Survive stomach acid
- Offer benefit to the body

Supplements



- Not many commercial products meet these criteria. Enteric coated products are able survive the stomach until they reach the more alkaline environment of the colon.
- Strains that work symbiotically are also key to their success in the host
- Best to purchase from a practitioner or health food store

Vitamin B6

- ❖ Assists in the manufacturing of the neurotransmitter dopamine (regulates attention, cognition, movement and pleasure)
- ❖ Assists in the detoxification of pesticides, additives, and heavy metals
- ❖ Helps in recycling methyl groups
- ❖ Water soluble and needs to be replaced daily
- ❖ Breaks down carbohydrates into glucose (sugar), supplying brain with fuel

Vitamin B6

- ❖ Supports production of the neurotransmitter GABA (neurotransmitter that makes us feel calm)
- ❖ Converts food to energy and helps release glycogen from the liver and muscles
- ❖ Metabolism of norepinephrine and acetylcholine (neurotransmitters for attention, mood, and memory)
- ❖ Assists in conversion of tryptophan to serotonin (the "feel happy" neurotransmitter)

Vitamin B6



Diets heavy in sugar and processed foods deplete B6


Chronic stress also depletes B6

Vitamin B6 Deficiency



- Mood swings
- Anxiety
- Depression
- Confusion
- Irritability
- Panic
- Forgetfulness
- Impaired concentration

Magnesium



Micronutrient found in bones and the teeth (65%) and 35% found in the blood, fluid, and brain tissues.


Anti-stress mineral

Found in dark green leafy veggies, nuts, legumes, whole grains, fruit and supplements.

Diuretics, alcohol, caffeine and sugar decrease magnesium.

Haas, E., M.D.; Levin, B. Ph.D.; R.D. (2006). *Staying Healthy With Nutrition: Celestial Arts.*

Magnesium




Deficiency hard to test for and uncommon in *healthy* people.

Poor health habits or medication can lead to deficiency.

Deficiency is fairly common.

Moshfegh A, G. J., Ahuja J, Rhodes D, LaComb R. 2009. (2009). What We Eat in America, NHANES 2005-2006: Usual Nutrient Intakes from Food and Water Compared to 1997 Dietary Reference Intakes for Vitamin D, Calcium, Phosphorus, and Magnesium external link icon. U.S. Department of Agriculture, Agricultural Research Service: U.S. Department of Agriculture.; USA.gov2013

Signs of Magnesium Deficiency



Loss of appetite	Apathy
Nausea	Seizures
Vomiting	Personality change
Fatigue	Abnormal heart rhythm
Weakness	Headaches
Numbness	Restlessness
Tingling	Headaches
Muscle cramps	Irritability
Apprehension	Decreased learning ability
Confusion	Poor memory

Haas, E., M.D.; Levin, B. Ph.D.; R.D. (2006). *Staying Healthy With Nutrition: Celestial Arts.* USA.gov 2013

Research Study

Research Study

Purpose of the Study

The purpose of this study was to explore the effects of adaptogens given to children with ADHD and comorbid disorders thereby improving their dysfunctional cortisol levels and therefore positively affecting the child's circadian rhythm and ability to manage stress throughout the day.

Hypothesis

Children given nutraceuticals, selected to impact the HPA axis, will experience an improvement in their circadian rhythms, neurocognitive functioning, and self-management as reflected in cortisol tests, neurocognitive testing and parent rating scores on behavior.

Hypothalamus-Pituitary-Adrenal Axis (HPA)

One of the principal stress response and regulation systems affecting children's social, emotional, and behavioral adjustment

A primary end-product of HPA axis activity is the production of glucocorticoid cortisol

The HPA axis follows a diurnal rhythm, producing varying levels of circulating cortisol over a 24 hour cycle

The HPA axis also produces acute elevations in response to stressful events

Hastings, P. D., Ruttle, P. L., Serbin, L. A., Mills, R. S. L., Stack, D. M., & Schwartzman, A. E. (2011). Adrenocortical responses to strangers in preschoolers: relations with parenting, temperament, and psychopathology. *Developmental Psychobiology*, 53(7), 694-710. doi: 10.1002/dev.20545

Hypothalamus-Pituitary-Adrenal Axis Adrenal Fatigue

"Hypoadrenia or hypocortisolism " describes a maladaptive state in which cortisol production is significantly diminished in response to chronic stress"

Edwards, L. D., Heyman, A. H., & Swidan, S. (2011). Hypocortisolism: An Evidence-based Review. *Integrative Medicine: A Clinician's Journal*, 10(4), 30-37.

Protocol

- Criteria was established by an initial phone consult
- Children discontinued all supplements for two week washout period. Children were permitted to remain on prescription medication.
- The researcher met with the parent and child and administered The CNSVS, The Vanderbilt ADHD Diagnostic Parent Rating Scale, and the Pediatric Symptom Checklist.

Protocol

- The researcher explained the supplement protocol and gave each parent 90 days of supplements and two cortisol testing kits.
- Families set up separate appointments at Dr. David Cantor's office for brain mapping and The IVA+ testing.
- The researcher checked in with families via email on a monthly basis.
- Families repeated testing after the 90 days of supplementation was completed.

Supplements

In morning:

- 2 Adrenal Essence
- 1 5-MTHF

In afternoon:

- 2 OmegaPure
- 1 Probiotic
- 1-2 scoops of RelaxMax



Results

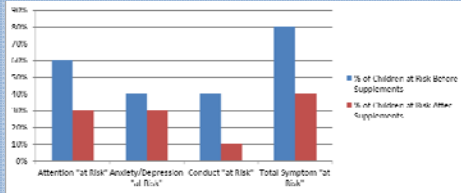
CNSVS

There were no significant changes found in any participants in the CNSVS testing

IVA+ Plus

There were no significant changes found in any participants in the IVA+Plus testing

Results of Pediatric Symptoms Checklist



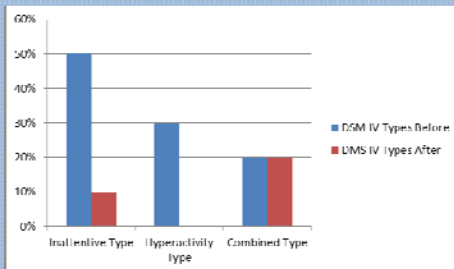
Percentage of children scoring "at risk" before and after the supplement intervention for the four domains measured in the PSC.

Results of Pediatric Symptoms Checklist

Variable	p<0.05
Attention	0.012
Anxiety/Depression	0.164
Conduct	0.071
Total Symptoms	0.004

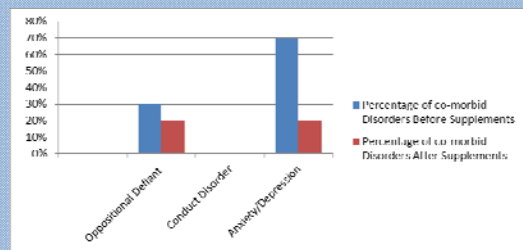
Statistical significance was found at a 95% confidence level.

Results of Vanderbilt Parent Rating Scale ADHD Types



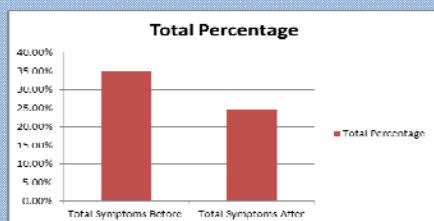
Percentage of all children's ADHD type based on the parents rating from the VADPRS before and after supplements.

Vanderbilt Parent Rating Scales Co-Morbid Disorders



Improvement in co-morbid disorders from the VADPRS. Note: A decrease in percentage indicates improvement.

Impairment in Performance



The third component of the VADPRS measuring Impairment in Performance.

Results of Vanderbilt Parent Rating Scale ADHD Types

Variable	p<0.05
Inattentive	0.011
Oppositional Defiant	0.09
Anxiety/Depression	0.014
Hyperactivity/Impulsivity	0.019
Conduct	0.443
Performance	0.269
Average Performance	0.052*
Total Symptoms	0.01

Statistical significance was found at a 95% confidence level.

Summary

TEST	Significant Changes
Pediatric Symptom Checklist	Attention Total Symptoms
Vanderbilt ADHD Diagnostic Parent Rating Scale	Inattentiveness Hyperactivity/Impulsivity Anxiety/Depression Total Symptom *Average Performance

- > qEEG results showed trends in a positive direction. Based on a consultants opinion, children began showing normalizing in their brain activity.
- > There were no significant changes in the CNSVS testing or IVA+ testing.

Qualitative Data



Seven parents reported in emails improvements in behavior and attitude.

One child had changes made in his Individual Education Plan.

One child had his medication reduced and another child's psychiatrist planned to reduce his medication after school was out.

Qualitative Data



Two children's parents reported a reduction in tics.

Seven parents continue to purchase the supplements.

One child did have a very negative experience and became violent on the supplements. As soon as the child was taken off the supplements, his behavior returned to normal.

Conclusion

The results of this pilot study suggest that supporting a child diagnosed with ADHD and co-morbid disorders with a supplement protocol may improve multiple hyperactivity/impulsivity, anxiety/depression and total symptoms as reported by results of the Vanderbilt ADHD Parent Rating Scale and Pediatric Symptom Checklist. Brain mapping also indicated positive trends. If the children had been followed up at three and six months, perhaps greater improvements would have also been realized in the neurocognitive testing.

Implications

Appropriate supplementation can alleviate many symptoms typically treated by medication and other therapies allowing children to self-regulate. Medication doses may be smaller and children would suffer from less side effects. Self-esteem and social skills may improve.

Parents ability to take care of their children and lessen overall family stress could be greatly enhanced with supplementation.

Clinicians and other professionals would be much more effective in diagnosing what behaviors need to be treated if the nutritional needs of the child were met first.



Thank You

Gut-Brain-Microbiome Axis and Its Affect on
Brain and Gut Health
Tourette's Syndrome Conference 2016



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