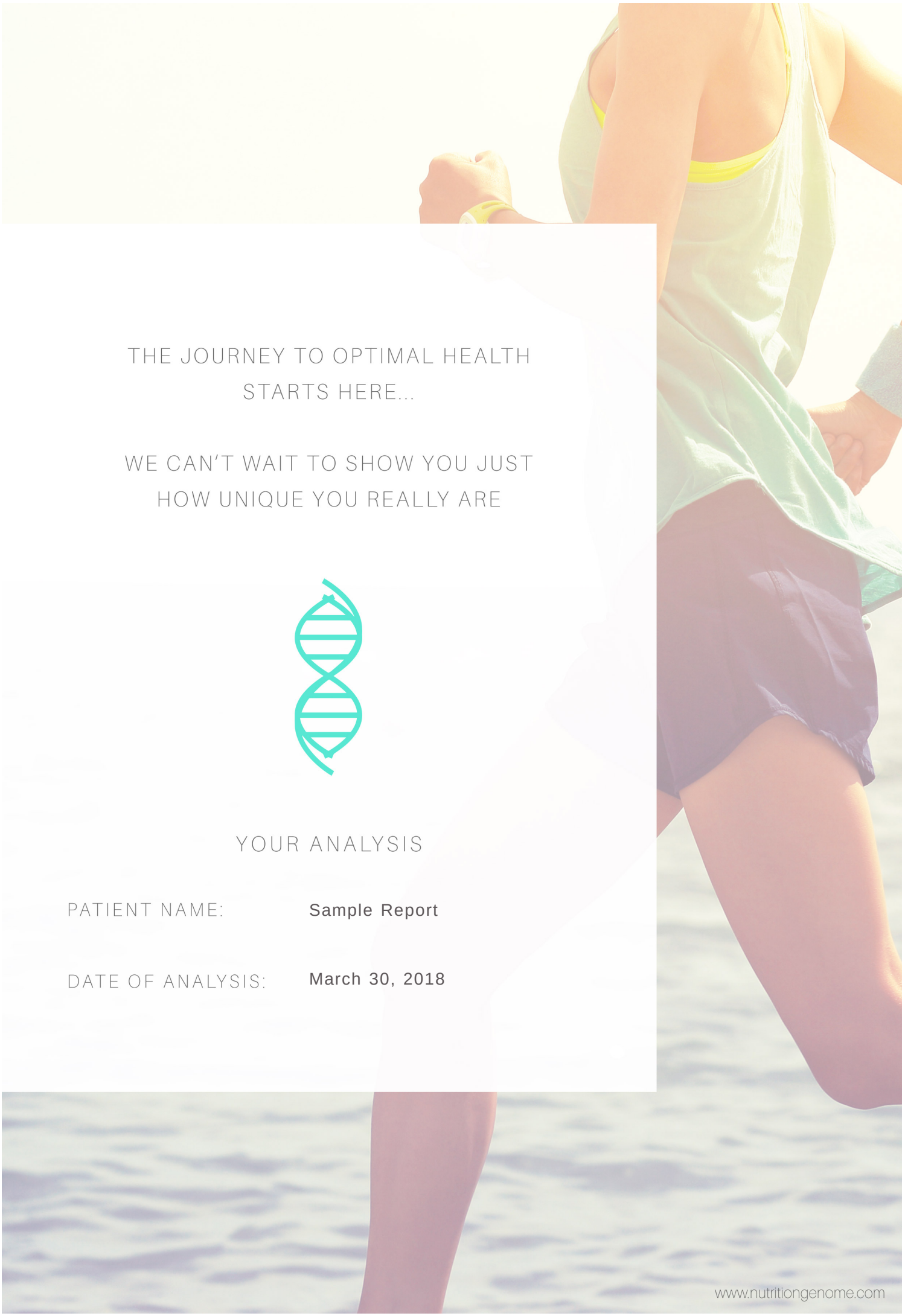
GENES ARE NOT YOUR DESTINY
THEY ARE YOUR BLUEPRINT

NUTRITION GENOME

GENETIC ANALYSIS REPORT

Welcome to your personalized nutritional DNA patient overview



THE JOURNEY TO OPTIMAL HEALTH
STARTS HERE...

WE CAN'T WAIT TO SHOW YOU JUST
HOW UNIQUE YOU REALLY ARE

YOUR ANALYSIS

PATIENT NAME: **Sample Report**

DATE OF ANALYSIS: **March 30, 2018**

STRENGTHENING YOUR GENOME WITH NUTRITION

When you hear the word DNA, what comes to mind? Your first thought may be ancestry. DNA is your blueprint for where you have come from and how you are designed. It may have been a while since you heard the word deoxyribonucleic acid (DNA), but we will show you that there is much more to DNA than your family line.

Genes are segments of DNA that are organized by 23 pairs of chromosomes from your mother and father. DNA encodes for proteins, known as the "workhorses" of the cell responsible for all the functions necessary for life. Enzymes are proteins, and many enzymes require nutritional co-factors to make sure these horses are not moving too slow or too fast.

People have approximately 20,000-25,000 genes in their genome. Everyone has the same set of genes, but each one can vary by a few letters (called alleles - think of them as the horizontal segments that connect ladder-like strands of DNA) between people. Changes in these genes are referred to as "SNPs" or single nucleotide polymorphisms and gene variants. Differences in these gene variants help determine your nutritional requirements and sensitivities based on enzyme function.

SNPs have been inherited over many hundreds of thousands of generations due to the geography of your ancestors and epigenetic changes in your diet, environment, and lifestyle. SNPs instruct enzyme function and are directed by vitamins, minerals, amino acids, and compounds to do their job of keeping you healthy. Their function is affected by deficiency, toxicity, stress, drugs and toxins. Optimizing enzyme function with the dietary co-factors may help lower inflammation, balance hormones, improve mental health, optimize digestion, increase athletic performance, and decrease the probability of disease.

Epigenetics is at the heart of understanding how to strengthen your genome. The "epigenome" is a term that describes a wide variety of chemical compounds that can tell your genome how to function by attaching to it (even turning genes on and off), and the epigenome remains flexible throughout your life (unlike your DNA, which remains fixed). These flexible epigenetic signals come from your stress levels, diet, environment, exercise, relationships and a sense of purpose. All of these factors determine the probability of certain hereditary susceptibilities being expressed, however, if we know where to focus, we can lower these probabilities.

Nutrigenomics is the study of how diet interacts with your genes and how individual genetic differences can affect the way you respond to vitamins, minerals, and compounds in the foods you eat. We believe that genes are not your destiny; they are your blueprint. Once you learn how to read the blueprint and make epigenetic improvements where there are weaknesses in the design, the foundation becomes healthier and more resilient; how we live can even influence the health of multiple future generations.

HOW TO READ YOUR REPORT

The Nutrition Genome Report is a book on you using genetic testing, nutrigenomics, and epigenomics.

You will see letters next to your genes using the alleles (base pairs) A, C, G and T. Each gene is represented by two letters to determine a "genotype." You will read this in the table as Normal, Heterozygous or Homozygous. It is important to note that "Normal" is also known as the wild type, meaning the most common genotype in our current population. A "Normal" genotype does not necessarily indicate a better genotype.

A heterozygous variant means you have 1 copy from your mother or father, while a homozygous variant means you have 2 copies, 1 from your mother and 1 from your father. Both a heterozygous and homozygous gene variant may affect enzyme function, increasing the sensitivity to deficiency or toxicity. The homozygous genotype is the most clinically relevant because it has the most impact on enzyme function. There are exceptions when multiple genes in a class are heterozygous and have a cumulative effect on enzyme function. It should be noted that there are many factors that can determine enzyme function, and therefore it is important to line up gene variants with symptoms, blood work, stress levels, exercise and family history. This is why it is recommended that you share your report with your health care practitioner.

On the next page, you will see a summary of your strengths and weaknesses. This is generated from your entire genetic analysis based on your gene variants and will tell you where the most focus is required.

CC	NORMAL	CC
CC	HETEROZYGOUS	CG
CC	HOMOZYGOUS	GG

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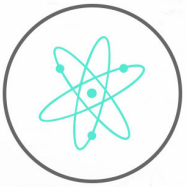
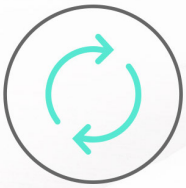
PERSONALIZED OVERVIEW

DIGESTION



METHYLATION CYCLE



HORMONE HEALTH

NEUROTRANSMITTERS & MENTAL HEALTH

INFLAMMATION & ANTIOXIDANT PROTECTION

DETOXIFICATION

DNA PROTECTION, DAMAGE & REPAIR

CARDIOVASCULAR HEALTH & ATHLETIC PERFORMANCE

STRENGTHS

DIGESTION

- You have a good conversion of plant-based omega-3 ALA (walnuts, flax seeds, pumpkin seeds) to EPA and DHA.
- Improved transportation of folate into the cell for the SLC19A1 gene.
- Vitamin D levels more likely to be in range due to normal variant of CYP2R1 gene.
- Normal adiponectin levels, linked to improved bodyweight, insulin and glucose levels.
- Lower risk of iron overload for the HFE genes.
- Your PPAR-alpha gene is functioning optimally to assist saturated fat metabolism and ketone body production during fasting. Assess your other fat metabolism genes for a more complete assessment.
- Improved glucose metabolism from saturated fat intake for the ACSL1 gene.
- Reduced likelihood of saturated fats causing weight gain for the APOA2 gene.
- You have an increased ability to breakdown lactose in milk.
- Lower probability of chronically elevated uric acid levels.

METHYLATION

- Your MTHFR A1298C gene function is working well for normal BH4 levels and neurotransmitter function.
- Improved breakdown of synthetic folic acid.
- You have improved B12 transportation due to normal TCN2 gene function.

HORMONES

- Your SHBG gene function is good, helping maintain normal testosterone, estrogen and progesterone levels. Other epigenetic factors should be considered for hormones.
- You have an improved DI01 gene function for T3 and T4 thyroid function, however other epigenetic factors should be assessed.
- Improved T3 and T4 thyroid function in the brain for the DI02 gene.

NEUROTRANSMITTERS

- You have improved PEMT function for phosphatidycholine levels for a healthy liver, memory, homocysteine levels and REM sleep.
- Normal levels of BDNF for improved glutamate modulation, brain repair, spatial learning, memory, and adaptability.
- You do not have the APOE E4/E4 genotype, improving cholesterol transport and the maintenance of brain neurons.

ANTIOXIDANTS AND INFLAMMATION

- Your catalase (CAT) gene working well, assisting with mitigating damage to your cells.
- Good glutathione antioxidant protection in the lungs for GSTM1, increasing the probability of longevity.
- Good glutathione antioxidant protection for breast or prostate health for GSTP1
- Your NOS1 gene is functioning well helping lower the inflammatory process from psychological stress.

DETOXIFICATION

- Good VOKRC1*2 function for normal vitamin K2 levels unless gut function is compromised from antibiotics, SIBO, leaky gut syndrome, IBS, IBD, Crohn’s disease or parasites.
- Good COQ2 gene function for a lower likelihood of statin drug induced muscle pain.

DNA DAMAGE, PROTECTION AND REPAIR

- Good DNA repair for colon health

CARDIOVASCULAR AND BONE HEALTH

- Lower levels of muscle inflammation post-workout, reducing the time needed for full muscle recovery and repair.
- Your LPA gene is functioning well, helping keep Lp(a) - a sticky form of LDL that affects plaque levels - at a healthy level.
- Your 9p21 gene is working well for cardiovascular health
- Normal or heterozygous variants in ADRB2, lowering the inflammatory response on the heart for chronic stress.
- Improved fibrinogen levels for the ESR2 gene
- Good F5 gene function for a lower probability of deep vein thrombosis

WEAKNESSES

DIGESTION

- You have a reduced conversion rate of plant-based beta carotene (squash, sweet potatoes, carrots) to vitamin A. This increases your need for foods higher in vitamin A like eggs, cod liver oil, wild salmon oil and organ meats for skin, digestion, healthy eyes, lungs, and immunity.
- Lower bifidobacteria levels in the gut that may decrease B12 absorption and GABA production due to variants in the FUT2 genes. This increases your need for prebiotic foods to help probiotic colonization like garlic, onions, leeks, pistachios, asparagus, bananas, kiwi, artichokes and foods high in polyphenols.
- You are more likely to have low B6 levels due to variants in the NBPF3 gene, increasing the sensitivity to medications that deplete B6 (oral contraceptives, antibiotics, ACE inhibitors, antacids, proton pump inhibitors and more). You need to focus on increasing foods high in B6 like wild salmon, pistachios, avocados and potatoes.
- You have variants in the FTO gene that increase ghrelin levels (hunger hormone) that could lead to overeating and weight gain. A focus should be on a protein and fiber-rich breakfast, monounsaturated and polyunsaturated fats, 7-8 hours of sleep per night, healthy vitamin D levels and aerobic exercise over 1 hour or high intensity exercise to stabilize ghrelin levels.
- Increased probability of elevated blood sugar from refined sugar and grains due to variants in TCF7L2. You may do better on a diet low in grains, higher in omega-3 fatty acids, diversified prebiotic foods, higher in olive oil, and includes cinnamon, turmeric and cordyceps mushrooms.
- Potentially elevated levels of histamines in the digestive tract due to variants in APB1 gene that encodes for the DAO enzyme. You may be more sensitive to gut dysbiosis and fluctuating estrogen levels (females). Histamine is lowered by Vitamin C, choline, folate, magnesium, chamomile, basil, stinging nettle, echinacea, fennel, ginger and wild oregano.
- Potentially elevated levels of histamine in the central nervous system, skin and bronchial tissue due to a heterozygous or homozygous HNMT gene. You may be more sensitive to gut dysbiosis and fluctuating estrogen levels (females). Histamine is lowered by Vitamin C, choline, folate, magnesium, chamomile, basil, stinging nettle, echinacea, fennel, ginger and wild oregano.

METHYLATION

- You have an increased need for riboflavin and methylfolate due to variants in the MTHFR C677T gene for normal homocysteine levels.
- You have an increased need for folinic acid, the second most common type of folate after methylfolate.
- Potentially higher sensitivity to B12 deficiency from antacids, antibiotics, proton pump inhibitors, Metformin, anticonvulsants, oral contraceptives and certain psychiatric medications due to homozygous MTRR gene.
- You have a higher need for magnesium and boron to assist normal SAMe levels for a healthy glutathione levels, joint and low back pain, a balanced mood and liver detoxification.

HORMONES

N/A

NEUROTRANSMITTERS

- You have potentially lower levels of dopamine due to a lower density of dopamine receptors. This could theoretically create a higher likelihood of addictive behaviors, compulsive eating and ADHD. Keeping your blood sugar balanced with adequate protein and fiber, high intensity exercise, lower media exposure, vitamin D, omega-3's and meditation all increase dopamine receptor density.
- You have a slower breakdown of dopamine, adrenaline and estrogen, creating higher circulating levels in response to stress due to variants in the COMT genes.
- You have a reduced glutamate to GABA conversion due to numerous variants in the GAD1 genes. If neurodegenerative disorders run in your family, all the genes associated with glutamate levels should be assessed.
- You may have a delayed recovery from head injuries due to variants in SLC17A7. It is advised to be proactive with zinc, omega-3 fatty acids, Lion's mane mushroom, magnesium and consistent exercise in case a head injury occurs.

ANTIOXIDANTS AND INFLAMMATION

- Your mitochondria (powerhouse of the cell) has a higher sensitivity to glyphosate (sprayed on GMO corn and soy), fluoridated water, chronic stress, poor sleep and shallow breathing. Increase foods that contain manganese, lycopene, and vitamin C, mushrooms like reishi and cordyceps, and exercise that encourages deep breathing.
- You have a higher sensitivity to the damage from foods fried in vegetable oils, viruses and mold due to an increased need for cell membrane support. Increase foods that contain choline, zinc, vitamin C, vitamin E and carotenoids to protect the cell

membrane.
- You have potentially higher free radical damage (inflammation) from statin drugs, iron levels that are out of range (low or high) and lead due to variants in the GPX1 gene. This increases your need for vitamin C, vitamin E, selenium, ginger, cumin, anise, fennel, caraway and cardamom.
- You have an increased need for foods high in lutein and zeaxanthin for healthy eyes.

DETOXIFICATION

- More unlikely to respond to Phenytoin (Dilantin), phenobarbital, omeprazole (Prilosec), Acetaminophen, codeine, ciclosporin (cyclosporin), diazepam, and erythromycin.

DNA DAMAGE, PROTECTION AND REPAIR

- You have an increased need for folate to improve DNA repair for the ATM gene in relation to pancreatic and breast (females) health.
- You Increased sensitivity to processed meats (hot dogs, salami, pepperoni) and colon cancer risk due to variants in GATA3. Reduce processed meat intake, optimize vitamin D levels and increase berries, apples, sauerkraut, broccoli, tomatoes, basil, rosemary, garlic, onions and leeks.

CARDIOVASCULAR AND BONE HEALTH

- Higher need for strategies to increase oxygen capacity for aerobic exercise due to variants in PPARGC1A gene
- You have a higher catabolic effect on muscle from overtraining requiring more post-workout recovery support like ice baths, purple sweet potatoes, blueberries, cherries and beets due to variants in TNFA gene.
- Higher probability of tendon and ligament injuries due to a homozygous variant in COL1A1, increasing the need for dietary collagen and vitamin C.
- You have a reduced PON1 gene function for pesticide detoxification, HDL and LDL oxidation.

YOUR PERSONALIZED DNA BASED GROCERY LIST

VITAMINS, MINERALS AND OTHER COMPOUNDS	FOODS TO EMPHASIZE
Folate	Broccoli, romaine lettuce, beets, liver, turnips, collard greens, spinach, hummus, pomegranates, sprouted lentils, parsley, potatoes, strawberries, oranges and unfiltered fermented drinks
B6	Wild salmon, wild cod, pistachios, avocados, Yukon gold or red potatoes, taro root, sweet potatoes, spinach, cauliflower and unfiltered fermented drinks
B12	Pastured eggs, grass-fed meat and wild fish
Prebiotics	Pistachios, leeks, asparagus, radicchio, bananas, garlic, kiwi, onions, artichokes, Tiger nuts, chicory root, yacon syrup and foods high in polyphenols
Probiotics	Fermented drinks like Kombucha, fermented veggies like sauerkraut, yogurt and kefir
Monounsaturated and Polyunsaturated Fat	Emphasize fish, almonds, pistachios, avocados, olive oil, walnuts, sunflower seeds, hemp seeds, pumpkin seeds and flax seeds (females) for monounsaturated and polyunsaturated fat intake
Omega-3's	Fish, fish oil and pastured eggs
Zinc	Beef, lamb, shellfish, liver and sprouted pumpkin seeds
CYP1A2 Foods	Carrots, parsnips, celery, dill, parsley, hops, cruciferous vegetables (especially fermented like sauerkraut), unfiltered beer, red wine, blueberries, blackberries, red grapes, kiwi, watermelon and spinach
Flavonoids	Celery, parsley, cranberries, red onions, red wine, apples, cherries, tomatoes, broccoli, kale and citrus
Resveratrol	Red wine, peanuts, pistachios, blueberries, bilberries, cranberries, cacao and muscadine grapes
Vitamin A	Pastured eggs, liver, cod liver oil, wild salmon oil, eel and grass-fed butter
Selenium	Selenium varies widely in the soil based on geography. All seafood, crimini mushrooms and unfiltered beer are sources of selenium.
Lutein and Zeaxanthin	Egg yolks, kale, collard greens, zucchini, romaine lettuce, broccoli, spinach and Brussels sprouts
Riboflavin	Liver, lamb, fish, yogurt and mushrooms
Polyphenols	Celery, parsley, high-quality olive oil, cloves, peppermint, anise, rosemary, sage, blueberries, bilberry, lingonberry, black elderberry, strawberries, apples, peppers, blackberries, cherries, red wine, raw cacao, pistachios, and flax seeds
Carotenoids	Carrots, tomatoes, squash, corn, orange peppers, red peppers, yellow peppers, pumpkin, red beets, yellow beets, red onions, sweet potatoes, wild salmon and pastured eggs
Vitamin D	Cod liver oil, liver, eggs and lard
Vitamin C	All freshly picked citrus, berries, broccoli, peppers and supplementation

FOODS, DRINKS, TOXINS AND ADDITIVES TO MINIMIZE OR AVOID

FOODS, DRINKS, TOXINS AND ADDITIVES	MINIMIZE OR AVOID
DNA Damage	High fructose corn syrup, hydrogenated oils, phosphoric acid, benzoic acid, calcium propionate, food dyes, pesticides, herbicides, heavy metal toxicity, fluoride, chemical cleaners, glyphosate (Roundup) on GMO crops, polycystic aromatic hydrocarbons highest in (vegetable oils and grains), binge drinking, smoking, and BPA plastic.
CYP1A2 Minimize	Fried meat, smoked meat and fish, non-organic grain-fed dairy, non-organic peanuts, oats, and Brazil nuts.
Food Dyes	FD&C Yellow No. 5, FD&C Red No. 2 and 3, Red 40, Yellow 5,Yellow 6 and Blue 1.
Sodium Benzoate	Citrus sodas and certain electrolyte tablets may contain it.
CYP1B1 Minimize	Vegetable oils (soy, corn, canola, sunflower, safflower), grains, charbroiled/burnt meats, smoked foods, cigarette smoke, gasoline/exhaust exposure, plastic water bottles, plastic wrap, styrofoam cups, grain-fed meat and non-organic dairy, non-organic corn and soy, tap water, personal care and laundry products that contain parabens, artificial flavors and artificial sweeteners.
Artificial Sweeteners	Aspartame and sucralose.
Acrylamide	French fries and fried chips.
Processed meats	Hot dogs, bacon, cured meats, sausages, salami, ham and other forms of processed meat.
Nitric Oxide Antagonists	Refined sugar, high fructose corn syrup, and vegetable oils (especially fried food).

YOUR PERSONALIZED BLOOD WORK RECOMMENDATION

These are recommended routine blood tests based on your genetic results. These recommendations do not mean that these markers will be out of range, but may be relevant.

RECOMMENDED BLOOD TESTS	BLOOD WORK DETAILS
Iron	Talk to your doctor about transferrin saturation (TS), serum ferritin level, and liver function if hemochromatosis runs in your family
B6	B6 levels may need to be tested
Vitamin D	Vitamin D should be between 35-50 ng/ml. Check both 25 and 1,25-dihydroxyvitamin D.
B12	If poor B12 status is suspected, methylmalonic acid (MMA) levels may be needed to accurately assess B12 status, absorption, and requirements
Homocysteine	Homocysteine should be between 7-9

FIND A NUTRITION GENOME RECOMMENDED DOCTOR

At Nutrition Genome, we care about you getting the best results from your analysis. The Nutrition Genome Report was designed to be compared with your family healthy history, personal health history, and current blood work so that you can determine where you need to focus to achieve optimum health.

To find a doctor that is experienced with nutrigenomics and can give you a full analysis, please go to www.nutritiongenome.com and click on "Find a Doctor" to see our growing list of recommended practitioners. If you are a doctor and would like to be added to our list, please contact us.

"I was a medical puzzle for nearly 2 decades before Nutrition Genome. I was diagnosed with a childhood epilepsy disorder when I was a pre-teen, and doctors could never explain why I didn't outgrow it. Nutrition Genome solved the puzzle that literally dozens of neurologists couldn't. Through an analysis of my genetic mutations and the biological reactions they caused, as well as a review of what medications had been effective & explain the problem. And better yet - they provided a solution in the form of supplements and dietary shifts. I have decreased my medication 50% and am continuing to decrease. What's more, I have hope for a future where I don't have to take medication at all - something that hadn't ever been on the table for the last twenty years. I would highly recommend Nutrition Genome to anyone with any type of medical puzzle - it literally changed my life"...Ashley

★★★★★

DIGESTION

Hippocrates once said,
"all diseases begin in the gut."

Our first section begins with DIGESTION, where a healthy body starts by determining your vitamin, mineral, protein, fat, carbohydrate and sugar metabolism.

- VITAMIN & MINERAL METABOLISM
- PREBIOTICS & PROBIOTICS
- PROTEIN METABOLISM
- FAT METABOLISM
- CARBOHYRATE METABOLISM
- LACTOSE INTOLERANCE
- HISTAMINES
- URIC ACID LEVELS

GENE	GENE FUNCTION	GENE RSID	NORMAL	HETEROZYGOUS	HOMOZYGOUS
BCMO1 A379V	BCMO1 encodes the conversion rate from β-carotene to vitamin A.				
		BCMO1 A379V-rs7501331	CC		
		BCMO1 R267S-rs12934922			TT
FADS2	The FADS2 gene encodes the conversion of plant based omega-3 fatty acid alpha linolenic acid (ALA) to EPA.				
		FADS2-rs1535	AA		
		FADS2-rs174575	CC		
FUT2	FUT2 gene controls prebiotic production, B12 absorption and how much bifidobacteria you carry in your digestive tract. Bifidus also produces intestinal folate.				
		FUT2-rs492602		AG	
		FUT2-rs601338		AG	
		FUT2-rs602662		AG	
SLC19A1	A protein encoded by this gene is a transporter of folate and is involved in the regulation of intracellular concentrations of folate.				
		SLC19A1-rs1051266	CC		
NBPF3	NBPF3 has been associated with vitamin B6 levels.				
		NBPF3-rs4654748			CC
SLC23A1	Solute carrier family 23 member 1 (SLC23A1) is one of the two transporters which aids in the absorption of vitamin C into the body. Polymorphisms in the gene are associated with reduced plasma vitamin C levels in the body.				
		SLC23A1-rs33972313	CC		
CYP2R1	CYP2R1 is connected to circulating vitamin D levels.				
		CYP2R1-rs10741657	GG		
		CYP2R1-rs12794714			AA
ACAT1-02	The ACAT gene converts protein and fat to ATP (energy) in the mitochondria, and plays an important role in cellular cholesterol homeostasis.				
		ACAT1-02-rs3741049	GG		
ADIPOQ	ADIPOQ encodes for adiponectin, a protein secreted by fat cells that affect insulin and glucose metabolism. Low levels of adiponectin play a role in obesity, insulin resistance and Type 2 diabetes.				
		ADIPOQ-rs2241766	TT		
HFE-C282Y	Variants in the HFE genes may lead to an iron overload due to increased iron absorption and disrupted metabolism.				
		HFE-C282Y-rs1800562	GG		
		HFE-H63D-rs1799945		CG	
SLC22A5	L-Carnitine is responsible for shuttling fats into your cells, modulating your lipid profile, glucose metabolism, oxidative stress, fat loss and inflammatory responses in the mitochondria.				
		SLC22A5-rs17622208			AA
		SLC22A5-rs2073643			CC
		SLC22A5-rs274567	CC		
		SLC22A5-rs274557	TT		
PPAR-alpha	The PPAR-alpha gene plays a vital role in fatty acid metabolism and ketosis, and is considered one of the most critical targets for ameliorating abnormalities with triglycerides, HDL, LDL, VLDL, and ApoB.				
		PPAR-alpha-rs1800206	CC		
ACSL1	Long-chain acyl CoA synthetase 1 (ACSL1) plays an important role in fatty acid metabolism and triglyceride synthesis. Disturbance of these pathways may result in dyslipidemia and insulin resistance, hallmarks of the metabolic syndrome.				
		ACSL1-rs9997745	AA		
APOA2	The APOA2 gene contains instructions for making a protein called apolipoprotein A-II, which is found in HDL cholesterol particles. The homozygous genotype has been linked to saturated fat intake and weight gain.				
		APOA2-rs5082	AA		

GENE	GENE FUNCTION	GENE RSID	NORMAL	HETEROZYGOUS	HOMOZYGOUS
FTO	Polymorphisms in the FTO genes have been shown to cause higher ghrelin levels (hunger hormone) in many populations, which can create a larger appetite and the potential for overeating.				
		FTO-rs9939609			AA
		FTO-rs17817449			GG
TCF7L2	TCF7L2 polymorphisms have been associated with low incretin hormones and impaired insulin secretion.				
		TCF7L2-rs7903146		TC	
LCT	LCT variants decrease the ability to breakdown lactose in dairy.				
		LCT-rs4988235		AG	
APB1	APB1 is encodes for the DAO enzyme to breakdown histamines.				
		APB1-rs1049742		TC	
		APB1-rs1049793		CG	
		APB1-rs10156191	CC		
HNMT	HNMT stands for histamine methyltransferase and requires a methyl group to breakdown histamine.				
		HNMT-rs1050891		AG	
ABCG2 (Q141K)	The ABCG2 (Q141K) gene is located at the membrane of kidney proximal tubule cells, where it mediates renal urate secretion. Variants in this gene are linked to reduced uric acid excretion.				
		ABCG2 (Q141K)-rs2231142	GG		

ANALYSIS DIGESTION

Beta Carotene to Vitamin A Conversion Rate-BCMO1

Improves BCMO1 Gene Function: Vitamin A in the form of retinol and zinc.

Decreases Gene Function: Relying on beta-carotene for vitamin A requirements.

Research: If you are heterozygous or homozygous for BCMO1 A379V and you have a heterozygous or homozygous BCMO1 RS267S, this means that you have a reduced conversion rate of beta-carotene to vitamin A. Many nutrition labels will have beta-carotene listed as vitamin A, however this is not true vitamin A.

The normal conversion for beta-carotene (carrots, sweet potatoes) to retinol is 1:6 and 1:12 for other carotenoids. Female volunteers carrying the T variant of rs7501331 (379V) had a 32% lower ability to convert beta-carotene, and those carrying at least one T in both SNPs (379V and R267S) show a 69% lower ability to convert beta-carotene into retinol.

You want to make sure you consume animal based vitamin A (pastured egg yolks, wild salmon oil, cod liver oil, butter) along with zinc for digestive lining repair, oral health, eye health, iron mobilization, mitochondria health, skin health (sunburns deplete vitamin A in the skin, and acne responds to vitamin A), healthy lung function, and increased immunity.

Prebiotics, Probiotics, B12

Improves FUT2 Gene Function: Prebiotics, probiotics, gelatin and B12.

Decreases Gene Function: Antibiotics, proton pump inhibitors, glyphosate, sucralose and Metformin.

Research: If you have heterozygous or homozygous variants in this FUT2 (rs602662, rs601338 and rs492602) you have an increased need for prebiotics, probiotics and B12. Gut flora plays a major role in anxiety (GABA production), depression, type 2 diabetes, immunity and nerve health.

People with homozygous (GG) and heterozygotes (AG) polymorphisms in the FUT2 gene have 15% lower vitamin B12 levels because it is not efficiently absorbed in their intestines.

Bifidobacteria is highly sensitive to glyphosate (a potent herbicide used on GMO corn and soy), and therefore choosing organic is important. Antibiotics, glyphosate and sucralose (Splenda) severely disrupt gut flora and increase the risk of salmonella and C-diff.

One study found that higher levels of indolepropionic acid produced by good bacteria due to a diet higher in prebiotic fiber-rich food decreased the risk of Type 2 diabetes.

Bifidobacteria are generally considered to synthesize folate (B9), biotin, thiamine, nicotinic acid, pyridoxine (B6), riboflavin (B2), and B12. The highest extracellular folate levels were produced by four strains of B. adolescentis and two of B. pseudocatenulatum. PABA

is found in certain foods and also help probiotics colonize.

Studies have found that red wine consumption can significantly modulate the growth of select gut microbiota in humans, which suggests possible prebiotic benefits associated with the inclusion of red wine polyphenols in the diet. This study also found that changes in cholesterol and C-reactive protein concentrations were linked to increases in bifidobacteria.

Drugs that deplete B12 include proton pump inhibitors, antibiotics and Metformin, and therefore may cause more B12 deficiency symptoms for those with variants in FUT2.

B6-NBPF3

Improves NBPF3 Gene Function: B6

Decreases Gene Function: Sugar, stress, high intake of alcohol and refined flour based carbohydrates, antibiotics, oral contraceptives, ACE inhibitors, antacids, proton pump inhibitors, Phenytoin, bronchodilators, Digoxin, diuretics, hormone replacement therapy, Estradiol, MAO inhibitors, St. John's Wort and Parnate.

Research: If you have a heterozygous or homozygous NBPF3 gene, you may require a higher intake of B6. Homozygotes (CC genotype) have approximately 2.90 ng/mL lower vitamin B6 blood concentration, while heterozygotes (TC genotype), have 1.45 ng/mL lower Vitamin B6 blood concentration.

Vitamin B6 plays a major role in neurotransmitter health. B6 deficiency can manifest as anorexia, irritability, anxiety, depression, muscle pain, bad PMS/low progesterone, nausea, seizures, migraines, dermatitis, age related macular degeneration (with low folate and B12) and lethargy.

Researchers have found an inverse association between ovarian cancer risk and vitamin B6 intake. Subjects with the highest vitamin B6 intake showed a 24 percent decrease in the likelihood of developing ovarian cancer compared to the individuals with the lowest intake.

Women of reproductive age, especially current and former users of oral contraceptives, teenagers, male smokers, non-Hispanic African-American men, and men and women over age 65 are most at risk of B6 deficiency. Data suggests that oral contraceptive users have extremely low plasma PLP levels. Three quarters of the women who reported using oral contraceptives, but not vitamin B6 supplements, were vitamin B6 deficient.

Vitamin D-CYP2R1

Improves CYP2R1 Gene Function: Vitamin D and vitamin D co-factors.

Decreases CYP2R1 Gene Function: Lack of sun exposure, high fructose intake and vitamin D co-factor deficiencies.

Research: Studies confirm that CYP2R1 is the principal 25-hydroxylase in humans and demonstrates that CYP2R1 alleles have dosage-dependent effects on vitamin D homeostasis.

Oral administration of vitamin D led to significantly lower increases in serum 25-hydroxy-vitamin D in heterozygous subjects than in control subjects, whereas homozygous subjects showed negligible increases. One study found that moderate swimming was beneficial in improving vitamin D status.

Vitamin D can influence the expression of more than 1,000 genes and vitamin D deficiency has been linked to fatty liver, seizures, infertility, osteoporosis, cancer, autism (mother deficient), depression, heart attacks, Alzheimer's, dementia, high blood pressure, autoimmune disorders and more. The literature is mixed on optimal vitamin D levels, which most likely vary based on your heritage, skin color and current health issues. Pesticides have been linked to suppressing vitamin D levels and creating a vitamin D deficiency. PON1 gene function should also be assessed.

Clinical vitamin D deficiency is below 25 ng/ml. There is little evidence to prove there is a benefit for levels above 50 ng/ml. The latest cancer research has found that women with 25(OH)D concentrations greater than 40 ng/ml had a 67% lower risk of cancer than women with concentrations less than 20 ng/ml.

Research has found that sunlight is the optimal way to optimize vitamin D levels along with exercise, vitamin D rich foods and vitamin D cofactors, however supplementation may be necessary.

Ghrelin and Appetite-FTO

Improves FTO Gene Function: A protein and fiber-rich breakfast, 7-8 hours of sleep per night, healthy vitamin D levels, and aerobic exercise over 1 hour or high-intensity exercise.

Decreases FTO Gene Function: Poor sleep patterns, high refined carbohydrate breakfast, high saturated fat and low polyunsaturated fat intake, low vitamin D levels, and a sedentary lifestyle.

The FTO gene is highly expressed in the brain regions controlling feeding and energy expenditure, and is one of many genes associated with being a risk factor for obesity, especially abdominal weight. Polymorphisms in the FTO gene have been shown to cause higher ghrelin levels in many populations, which can create a larger appetite and the potential for overeating.

FTO encodes for an enzyme able to remove methyl groups from DNA and RNA, and the FTO polymorphisms may reduce the methylation of ghrelin (hunger hormone), leading to higher ghrelin levels and potentially affecting other genes. Although rs9939609

has been replicated across a number of cohort studies for obesity, there remains significant variance due to epigenetic expression.

Studies have proposed that FTO alters dopamine signaling, affecting reward brain structures. This may explain why the FTO rs9939609 homozygous genotype preferentially selects high calorie/high-fat food compared to the normal TT genotype. Multiple studies have shown that a high dietary saturated fat intake (higher than 15.5% energy) and a low dietary polyunsaturated fat intake further increased the risk of being overweight or abdominally obese for the AA genotype. The non-risk TT allele carriers appeared to be unresponsive to dietary saturated fat intake or the dietary polyunsaturated to saturated fat intake ratio in regards to obesity.

Grehlin is highest in the fasting state, before meals, and at night, falling within one hour of a meal. Research has found that a breakfast centered around protein and fiber-rich carbohydrates (especially prebiotic fiber) was the most effective at suppressing ghrelin levels throughout the day, while also focusing on polyunsaturated and monounsaturated fats.

In a single-blind crossover study, three high fat meals (70% of energy) rich in monounsaturated (MUFA), polyunsaturated (PUFA) or saturated fat (SFA) in 16 women with obesity were tested. A decrease in ghrelin was significantly greater for PUFA and MUFA vs. SFA while appetite suppression was significantly greater for PUFA vs. both SFA and MUFA. One study also found that subjects with vitamin D levels of less than 20ng/ml had significantly higher ghrelin levels than those with a vitamin D level greater than 20/ml

People with the homozygous FTO genotypes may be more prone to overeating when eating a high-saturated fat meal or purely refined carbohydrate breakfast and getting poor sleep due to higher ghrelin levels. One study found that a reduction of sleep duration to 4-hours for two consecutive nights was shown to decrease circulating leptin levels and increase ghrelin levels, as well as self-reported hunger.

The key to improving FTO gene function is through lowering ghrelin levels, and those with the homozygous genotypes may gain the most significant benefits from preventative and treatment strategies aimed at targeting the ghrelin system and modulating reward responsiveness. The ANKK1 gene for dopamine receptors is also a relevant gene for appetite control and should be reviewed as well.

Regarding exercise, research has shown that doing 120 min prolonged treadmill exercise with mix intensity or high-intensity exercise was the most effective at suppressing ghrelin, while weight training or low-intensity exercise did not have the same effects. If weight loss and appetite suppression is your goal, aerobic exercise with a mixture of high intensity may be the best approach. .

We recommend reviewing ANKK1, PPAR-alpha, ACSL1, APOA2, ADIPOQ, SLC22A5, FUT2 and CYP2R1 if your goal is weight loss and you want to further assess your saturated fat metabolism.

Carbohydrates-TCF7L2

Improves TCF7L2 Gene Function: A Paleolithic diet, omega-3 fatty acids, olive oil, turmeric, cinnamon, prebiotics, organic coffee, and cordyceps mushrooms.

Decreases TCF7L2 Gene Function: Refined sugar and grains.

Research: The TCF7L2 gene has become the strongest indicator of Type 2 diabetes and gestational diabetes risk for multiple ethnicities in studies. A meta-analysis how also found an association with breast, prostate and colon cancer risk, all of which are connected to blood sugar levels and the risk is reduced by many of the same nutrients that improve this gene's function. Other genes and family history need to be assessed for cancer risk and prevention.

This gene is unique in its relation to Type 2 diabetes because people with variants in TCF7L2 may not exhibit risk signs like obesity. In fact, they may have a low body mass index (BMI) and low triglycerides. The increased risk is hypothesized to be due to the effect of TCF7L2 on the sensitivity of the pancreatic β-cells to incretins, not overall insulin sensitivity.

Incretins are hormones that are released from the gastrointestinal tract after a meal and regulate the amount of insulin secreted. The two most important incretin hormones are GLP-1 and GIP. Researchers believe that increasing incretin sensitivity may decrease the risk of type 2 diabetes.

One study found that the consumption of meals based on the Paleolithic diet (no grains or dairy) focusing on fish, polyphenol rich foods, fiber rich vegetables and spices high in phytochemicals resulted in significant increases in incretin and increased perceived satiety (feeling full). All three test meals were normalized to contain 50 grams of carbohydrates. Sufficient protein in particular shows promise in the management of type 2 diabetes by stimulating incretin, insulin secretion, and slowing gastric emptying.

Studies have demonstrated that turmeric significantly increases the secretion of the incretin GLP-1. Another study found that cinnamon lowers blood glucose usually within physiological levels without hypoglycemia and increases satiety, showing it may act by potentiating the effects of incretin hormones.

There is a progressive deterioration in β-cell function in patients with type 2 diabetes. In vitro studies demonstrated that pancreatic β-cell viability increased dramatically with cordyceps extract treatment, implying that cordyceps protects β cells. This is crucial for the TCF7L2 gene due to the communication between pancreatic β-cells and incretins. The researchers concluded “the potential ability of cordyceps to preserve beta-cell function may afford a promising therapy for diabetes.”

Histamines-APB1

Improves APB1 Gene Function: Vitamin C, choline, folate, magnesium, chamomile, basil, stinging nettle, echinacea, fennel, ginger and wild oregano.

Decreases Gene Function: Poor gut flora, gluten sensitivity, too many fermented foods, red wine, NSAID's, antidepressants, histamine H2 blockers, antihistamines, antiarrhythmics, immune modulators, deficiencies in vitamin C, choline, folate and magnesium.

Research: APB1 encodes for the DAO enzyme and is responsible for histamine breakdown primarily in the digestive tract.

For ABP1 the most relevant polymorphisms are rs10156191, rs1049742, and rs1049793. For Asian and African populations, the ABP1 polymorphisms rs45558339 and rs35070995 are relevant and currently not genotyped.

Histamine is involved in the regulation of gastric acid secretion, central nervous system functioning, bronchial asthma, and hypersensitivity reactions. It is expressed highest in the kidney and liver, as well as the spleen, prostate, ovary, colon and spinal cord.

Signs of histamine intolerance are heartburn, indigestion, itching, headaches, migraines, anxiety, arrhythmia, hypertension, diarrhea, hives, fatigue, abnormal menstrual cycle and nasal congestion.

Histamine has been implicated in the pathogenesis of migraines, especially in women. There may be a compounding effect with estrogen levels and histamine to cause a migraine. The DAO SNP rs10156191 is associated with the risk of developing migraine, particularly in women. Red wine is higher in histamines than white wine, and headaches from red wine may be due to a histamine sensitivity.

In some people, foods such as egg white, shellfish and strawberries seem to trigger direct histamine release from mast cells and episodes of urticaria are related to ingestion of these foods.

The polymorphism in rs10156191 is also associated with the clinical hypersensitivity response to NSAIDs.

Histamines-HNMT

Improves HNMT Gene Function: Vitamin C, choline, folate and magnesium, chamomile, basil, stinging nettle, echinacea, fennel, ginger and wild oregano.

Decreases HNMT Gene Function: Poor gut flora, gluten sensitivity, too many fermented foods, food dyes, sodium benzoate, and deficiencies in vitamin C, choline, folate and magnesium.

Research: HNMT stands for histamine methyltransferase. HNMT is the primary enzyme responsible for histamine metabolism in the skin, bronchial epithelia and central nervous system. This gene requires adequate methyl donors from methionine and choline. If you do not have enough methyl groups available, you may more prone to high histamine levels and subsequent sensitivity to dietary histamines. Magnesium deficiency increases histamines and makes the DAO enzyme slower and copper increases the DAO enzyme. HNMT polymorphisms differ considerably between Chinese and American populations.

Signs of histamine intolerance are heartburn, indigestion, itching, headaches, migraines, anxiety, arrhythmia, hypertension, diarrhea, hives, fatigue, abnormal menstrual cycle and nasal congestion.

Histamines are highest in fermented foods, cured meats, vinegar based foods, dried fruit, peanuts, smoked foods, alcohol, canned foods, raw tomatoes, raw spinach and eggplant. Cooking reduces histamines.

Certain medications can also increase histamines in the body like NSAID's, which also deplete folate and vitamin C. Increasing folate, magnesium and choline along with vitamin C helps breakdown excess histamines.

In children with ADHD, the adverse effect of food dyes and sodium benzoate on ADHD symptoms was determined by histamine degradation in the rs1050891 HNMT polymorphism.

In women, estrogen promotes the release of histamine, and high estrogen/low progesterone levels can make seasonal allergies worse. Environmental estrogens (xenoestrogens) including BPA plastic and phthalates enhance allergic sensitization in animal models and may enhance development of disorders like asthma in humans.

METHYLATION CYCLE

The METHYLATION CYCLE is also referred to as the "B Vitamin Cycle."

Our bodies use methylation to create healthy genetic expression, lower stress levels, increase energy, balance neurotransmitters (mood), boost fertility, remove toxins, and improve immunity.

- MENTAL HEALTH
- HEART HEALTH
- HOMOCYSTEINE LEVELS
- PREGNANCY
- LIVER HEALTH