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| **Peptide Name** | **Function** | **Strategies** | **Other Information** |
| **5-HT2A**  **rs6311 and rs6313**  (Serotonin) | * Associated with elevated stress perception, low vagal tone, IBS, OCD, and depression * Reduced capacity to regulate stress, low vagal tone, anxiety depression, OCD, IBS (esp. females) * Associated with BDNF in a reciprocal relationship | * Moderate intensity aerobic exercise * Green or black tea * Tryptophan, prebiotics, probiotics, B2, B6, B12, and folate | * Minimize chronic stress, poor gut flora, high-dose lithium, cannabis use, and excessive smartphone use * Relevant genotype: heterozygous or homozygous   + T allele is abundant in females with OCD |
| **5-HT2A**  **Rs6314**  (Serotonin) | * Associated with poor episodic memory | * Mediation * Green or black tea * Tryptophan * B2, B6, B12, folate * Ginkgo biloba | * Minimize chronic stress, poor gut flora, high-dose lithium, cannabis use, and excessive smartphone use * Relevant genotype: Heterozygous or homozygous |
| **9p21** | * A SNP that is associated with heart attacks and CV disease * Targets the heart | * Modified by a prudent diet high in raw vegetables and fruits in South Asian, Latin American, Arab, Chinese, and European populations * Higher intake of raw fruits and vegetables | * Variants for rs4977574 * Diets lowest in fruits and vegetables and two copies of the risk allele was associated with a 2-fold increase in risk for heart attacks and a 1.66-fold increase in risk for CV disease * Relevant genotype: heterozygous and homozygous * Minimize low intake of raw fruits and vegetables |
| **ABCG2**  (Uric Acid) | * Associated with Gout | * Hydration, Cold Immersion, bioflavonoids, anthocyanins, flavonoids, olive oil, vitamin C | * Minimize sugar, high fructose corn syrup, dehydration, high lead levels, chemotherapy for leukemia * Relevant genotype: heterozygous and homozygous |
| **ACE1** | * Main role is conversion of angiotensin I to angiotensin II 🡪 constricting blood vessels and elevating BP * Targets BP * Associated with high BP and ACE2 imbalance and the lungs | * Inhibition in bilberry, grapes, allicin (raw garlic), cinnamon, and jasmine * Total fat intake below 37% * Limiting saturated fat to 22g per day * Raw garlic extract | * Part of the renin-angiotensin system * Relevant genotype: wild type * Minimize high saturated fat diet over 37% of total calories |
| **ACE2** | * Degrades angiotensin II * Provides a balance for ACE1 by dilating blood vessels and lowering BP * Main receptor for spike protein in COVID19   + Cleaves and allows fusion of viral and cell membranes * Targets BP * Associated with high BP and ACE1 imbalance and lungs | * Potassium * Vitamin D * Resveratrol * Curcumin | * Age, sex, and genetic variants in the ACE2 gene can affect ACE2 levels * Rs2106809 exhibit primary effects on ACE2 levels * Levels tend to be greater in AA or AG genotype compared to GG * Relevant genotype: homozygous * Minimize smoking and a high saturated fat diet of over 50% of total calories |
| **ACSL1** | * GG wild-type homozygotes had higher fasting glucose & insulin concentrations compared with minor A allele carriers from fat intake | * Fat intake of less than 35% of total calories or higher intake of polyunsaturated fats normalized biomarkers for GG subjects * Monosaturated fats did not affect this genotype | * GG homozygotes were more insulin resistant |
| **ACSL1**  (Fasting Glucose) | * Associated with fasting glucose from high fat diet | * Monosaturated or polyunsaturated fats to replace saturated fat | * Minimize saturated fat * Relevant genotype: wild type |
| **ACTN3**  Wild type & Heterozygous | * Targets muscle fibers * Associated with type 2 fast-twitch muscle fibers, reduced muscle damage, and reduced risk of injury | * N/A |  |
| **ACTN3**  Homozygous | * Targets muscle fibers * Associated with fewer type 2 fast-twitch muscle fibers, higher muscle damage, and increased risk of injury | * More rest days * Cold therapy post-workout * Hamstring and ankle strengthening | * Heavy training without enough recovery days |
| **ADD1** | * Associated with HTN in Asians. | * Diet high in potassium and low in salt | * Carriers for the “T” allele responds better to diuretics and sodium-restricted diets |
| **ADD1** | * Correlated with a higher incidence of high BP with Asian populations * Targets BP | * Salt reduction and increase in potassium lowers BP by 10 mg compared to rs4961 GG genotypes * Low salt and high potassium intake | * Variants with rs4961 were significantly associated with HTN in Asians * Relevant genotype: Homozygous * Minimize high sodium intake, excess weight, high sugar intake, lifestyle, smoking, and stress |
| **ADIPOQ**  (Adiponectin) | * Variants have lower levels of adiponectin may lead to obesity, insulin resistance, and T2DM * Associated with obesity, insulin resistance, colon cancer, cardiovascular disease, gestational diabetes, and T2DM * Encodes for adiponectin | * Increase: Coffee, blueberries, mulberries, cranberries, raw almonds, strawberries, chili peppers, and ginger, rose hips, curcumin, berberine * Breast Cancer Patients: Responded favorably to 750mg of ginger and swimming 4x/week to increase adiponectin and glutathione levels * Synergy with rosehips and adiponectin levels   + Rosehip extract (1mg) reduced growth of triple negative breast cancer by 50% and limited spread by 45% * Omega-3 fatty acids, pterostilbene, coffee, rose hips, berberine, chili peppers, ginger, and curcumin * Avoid red meat and processed meat | * Ashkenazi Jewish & Chinese populations have a higher sensitivity to red meat intake for colon cancer risk and insulin resistance * Avoid red meat and processed meat * Relevant genotype: Heterozygous or homozygous |
| **ADRB2** (Epinephrine) | * Associated with IBS * Associated with anxiety and chest pain * Abundantly expressed in cardiac cells, bronchial smooth muscle cells, and is connected to stress levels + heart health * Main target of catecholamine epinephrine * Primary mediator of stress response * Widely expressed in GI tract and CNS * Mediates HR, BP, Respiration, Vasodilation in normal coronary arteries * G allele carriers with IBS have more severe bowl symptoms and symptomatic days with greater severity | * Deep breathing, methods, magnesium, Vitamin C * Look at COMT gene function * Stress relief * Adaptogens * Deep breathing (e.g., box breathing) practice | * Minimize chronic stress * Relevant genotype: Homozygous * Rs1042714 🡪 decreased receptor degradation and down regulation 🡪 adrenergic response   + Also associated with psychiatric diagnosis, especially anxiety   + Associated with homozygous or heterozygous genotypes |
| **AGTR1**  (Total Fat & BP) | * Up-regulation was shown in research to predict the development of HTN, CV disease, metabolic syndrome, & NAFLD from excess fat AND sugar/carbohydrates in the diet   + Fat = major modifier | * Homozygous Genotype + HTN, CV disease, metabolic syndrome, NAFLD 🡪 Review fat intake * Check folate requirements with MTHFR, Vitamin C requirements with SLC23A1 for Nitric Oxide   + Nitric Oxide levels need improving | * Polymorphisms affect the receptor expression & activity   + CC genotype most associated with AGTR1 up-regulation in gene activity * Nitric Oxide down-regulates AGTR1 🡪 balanced variant up-regulation + BP( Homo/Heteroz) |
| **AGTR1** (in men) | * Targets BP * Associated with high BP from a high-fat diet | * Decreasing overall fat intake * Increasing specific phytoestrogens found in hummus, peanuts, miso soup, tahini sauce, and cruciferous vegetables | * Minimize a high fat diet * Relevant genotype: Homozygous |
| **AGTR1** (in women) | * Targets BP * Associated with high BP from a high-fat diet | * Decreasing overall fat intake * Increasing vitamin C, folate, L-arginine, magnesium, Vitamin D, DHA, and leafy green vegetables | * Minimize a high fat diet * Relevant genotype: Homozygous |
| **ALDH2**  (Ethanol Metabolism) | * Alterations in alcohol metabolism are more common in Asian populations * Influence level of accumulation of acetaldehyde in the body 🡪 alcohol adverse reactions (flushing, nausea, palpitation, headache, drowsiness, breathlessness, discomfort) * Reduced risk of TB | * Diet higher in potassium from plants and lower in salt is recommended | * East Asian Ancestry * Hypothesis is that TB is or was an endemic disease in Korean and Japanese and Chinese populations 🡪 shaping human genome * Associated with carcinogenic activity of head, neck, colon, liver, and breast tissue( Homo/Heteroz) |
| **ANKK1**  (Dopamine) | * Associated with addictive behavior, ADHD, compulsive eating, and obesity * Modulates the density of dopamine receptors in the brain | * Meditation * 8 hours of sleep * Vitamin D, Omega 3 fatty acids, fiber * High intensity exercise * Low media exposure | * Minimize refined sugar, elevated lead levels, elevated copper levels, low iron, excessive media exposure * Relevant genotype: Heterozygous or homozygous |
| **ANKK1** | * Targets dopamine receptors * Associated with negatively affecting cognitive outcome after mild TBI | * Mediation * 8 hours of sleep * Vitamin D, Omega-3 fatty acids * Fiber | * Relevant genotype: Heterozygous or homozygous * Minimize refined sugar, elevated lead levels and copper levels, low iron, excessive media exposure |
| **APB1 (DAO)** | * Targets Histamines * Associated with histamine-related digestive disorders, nasal congestion, headaches, anxiety, arrhythmia, HTN, diarrhea, urticaria * Associated with migraines | * Vitamin C, choline, folate, Mg, chamomile, basil, stinging nettle, echinacea, fennel, ginger, wild oregano | * Minimize NSAIDs, aged foods/drink, poor gut flora, antidepressants, H2 blockers, antihistamines, antiarrhythmics * Relevant genotype: Homozygous |
| **APOA2**  (Lipoprotein lipase) | * Act as a satiety signal with saturated fat * Negatively affect function of lipoprotein lipase * Responsible for breaking down fat | * Eat less than 22g of saturated fat/day   + Eliminate most dairy to make this easier * Standing desks or generally moving 🡪 fat breakdown (sedentary does opposite) | * Homozygous GG genotype had BMI 6.8% higher than normal and heterozygous genotypes when consuming over 22g of saturated fat |
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| **APOA2**  (Lipoprotein lipase) | * Associated with higher BMI with a saturated fat intake over 22g per day | * Less than 22g of saturated fat per day * Standing desks / constant movement 🡪 stimulate LPL | * Minimize Saturated fat (mainly from dairy) and sedentary lifestyle * Relevant Genotype: **Homozygous** |
| **APOE-e2/3 & -e2/2** | * 7.2% of the world population * Newest ApoE variant * More protective against cognitive decline and heart disease * Greater probability of survival to an advanced age * Associated with increased ApoE protein expression, increased plasma triglycerides, and decreased plasma cholesterol * Higher increase in HDL levels from endurance exercise * E2 and E3 accumulate in neurons 2-4-fold higher than E4 * Benefit from non-phospholipid fish oil intake * Associated with a low Alzheimer’s dementia odds ratios and exceptionally low odds ratio compared to e4/e4 | |  |
| **APOE-e3/3** | * Most common ApoE in agricultural communities * Extended cognitive fitness and enhanced expression of anti-aging sirtuins * Improved HDL and LDL profile * Improved ability to repair synapses and neural protection * Higher viral protection * Higher plant bioactive compounds * E2 and E3 accumulate in neurons 2-4-fold higher than E4 * Carriers can benefit from non-phospholipid fish oil intake | |  |
| **APOE-e4** | * Higher LDL levels in e4 carriers * No reduced risk of Alzheimer’s in *e4*   + Reduced risk in APOE-*e3*   + More common in Caucasians and Asians with northern ancestry * Associated with Parkinson’s, Huntington’s, depression, bipolar, migraines, and anxiety * Oldest hunter-gatherer allele | * Hunter gatherer diet   + focuses on neural repair and preservation   + Animal based protein, Creatinine, polyphenols, diversified plant fiber, nuts, seeds, antioxidants, high potassium, low salt, low carbohydrates   + Modified version: Low carb, may include alcohol and dairy * 30 min cardio 5x / week * 8 hours sleep | * Remains high in regions where economy of foraging still exits, or food supply is scarce * Highest clusters found in Africa, Oceania, and Australia with frequency changing in extreme latitudes * Avoid high sugar or carb diet * Minimize processed diet, smoking, high mercury, or copper levels, T2DM, TBIs, and air pollution * Relevant genotypes: e4, e2/e4, e3/e4, e4/e4 |
| **APOE-e4** | * Higher Vitamin D and Calcium levels than e3 * Higher fertility rates in females   + Higher progesterone levels   + Decreased perinatal and infant mortality   + Improved newborn health status   + Fetal mental development and neural protection * Improved utilization of fatty acids as energy for increased endurance and migration capability * Better equipped to deal with bacterial infections * Strong risk for Alzheimer’s disease | * Avoid Mediterranean diet * Hunter Gatherer diet   + Protein, Choline, Omega-3’s, Uridine, Creatinine, Berries, Fiber, Nuts, Seeds, Antioxidants   + Low carbohydrate   + High potassium * Avoid alcohol * Cardio 30min/day x5d per week 🡪 reduced risk of e4 and Alzheimer’s disease and improved lipid markers * Clean air * 8 hours of sleep per night * Promote neurite outgrowth: Lion’s mane mushroom, reishi, tiger milk mushroom, Ganoderma neo-japonicum, and Cordyceps militaris * Vitamin B, C, E 🡪 improved memory * Intermittent fasting (13-16 hours) * Selenium, Lithium * Phospholipid-based EPA and DHA instead of fish oil * Ashwagandha, Polyphenols (piceatannol, fisetin, querecetin, and resveratrol) | * Strong risk for Alzheimer’s disease * Reduced neural repair (esp. from injuries and poor sleep patterns) * Reduced cognitive fitness later in life * Less viral protection and higher LDL compared to non-E4 * Lower creatinine levels later in life * Reduced expression of anti-aging sirtuins * Lower antioxidant defense * Lower beta-carotene levels * Less responsive to bioactive plant compounds compared to non-E4 * Fish oil supplements are not effective |
| **APOE-e4/4, -e3/4, and 3-2/4** | * Oldest hunter gatherer allele that remains high in regions where an economy of foraging still exists or where food supply is often scarce. * 2/3 and 3/4: Negatively affects concussion recovery * 3/4 and 4/4: Higher VO2 max response compared to 3/3 carriers   + Minimize high refined carbohydrate and sugar diet and < 7 hours of sleep   + Follow hunter-gatherer diet, 30 min cardio x5/week, 8 hours of sleep | | * High clusters found in Indigenous populations in Central Africa, Oceania, and Australia * Changes at extreme latitudes   + above 45th parallel and near equator |
| **ARMS2** | * Second major ARMD susceptibility gene next to CFH * Polymorphisms disrupting mitochondrial function in the retina | * Lutein, zeaxanthin, bilberry, lingonberry * Vitamin C and Vitamin E * DHEA * Zinc | * Minimize Smoking * Relevant genotype: Homozygous * Minimize or avoid smoking |
| **BCMO1**  (Vitamin A) | * Associated with digestive lining repair, oral health, eye health, iron mobilization, mitochondrial health, skin health, lung function, and lowering immunity | * Vitamin A supplement | * Minimize reliance on only beta-carotene for Vitamin A * Relevant genotype: Heterozygous or homozygous |
| **BDNF**  aka Brain-Derived Neurotrophic Factor  (Glutamate modulator) | * Compromises neuroplasticity & cognitive function * Diets with high saturated fat decrease levels * Variants have lower baseline levels   + Cumulative effect when combined with the *e4* allele 🡪 High saturated fat diet problematic for cognitive health * CT and TT genotypes have lower secretions of BDNF 🡪 impaired glucose metabolism * Decreased in bipolar disorder during manic and depressive episodes * Modulator of glutamate * Negatively affects concussion recovery | * Diet with low saturated fat * Review PPAR-alpha and APOE genes * Running * DHA * Green tea * Lithium * Acetylcholine * Bifidobacterium longum * Sauna | * In rat research models, supplementation of high saturated fat diet with Vitamin E dramatically reduced oxidative damage and reduced levels of BDNF * Minimize chronic stress, high blood sugar, and head injuries * Relevant genotype: Heterozygous or homozygous |
| **CAT** | * Reduces oxidative stress * Present in all aerobic cells * Highest correlation to prostate, breast, liver, and blood cancer | * CAT C26T may have a higher need for flavonoids, selenium, ginger, cumin, anise, fennel, caraway, cardamom, monitoring iron levels, Lion’s Mane mushroom, * Deep breathing relaxation techniques (yoga, meditation, prayer) 🡪 assist catalase * Boron, lutein, holy basil | * Rs1001179 polymorphism (C262T) = most extensively studied   + Reported to indicate lower CAT enzymatic activity, higher sensitivity to oxidate stress, increased DNA damage risk 🡪 cancer * C allele is less commonly studied * Minimize Oxidative stress and BPA plastic * Relevant genotype: heterozygous or homozygous |
| **CBS**  (B6) | * High homocysteine * Low hydrogen sulfide * Ulcerative Colitis * Alzheimer’s Disease * Down’s Syndrome * Potentially diabetes | * B6 Supplement | * Minimize antibiotics, BC, ACE inhibitors, antacids, PPI, phenytoin, hormone replacement therapy, estradiol, MAO inhibitors, St. John’s Wort, High cysteine, and parnate( Homo/Heterozygous) |
| **CFH** | * Variants 2-fold higher risk of ARMD per copy in European descents * Rs1061170 polymorphism impacts significantly on retinal function in early AMD patients and supports the hypothesis that a dysfunctional CFH might result in early retinal function loss due to a reduction in the immune antioxidant defense mechanism | * Lutein and Zeaxanthin can inhibit oxidation of cell membranes and may be protective against UV-induced eye damage * Vitamin C, E, Zinc, Bilberry, and omega-3 fatty acids * DHEA * Lingonberry | * Complement factor H polymorphism associated with ARMD * Blue-eyed adults have less lutein and zeaxanthin in their retinas   Relevant: Homo/Heterozygous |
| **COL1A1** | * Targets collagen * Associated with lower type 1 collagen and increased risk of torn ACL and shoulder dislocations | * Vitamin C and B6 * Zinc, Copper * Glycine, proline, lysine * Cryotherapy | * Relevant genotype: wild type * Minimize deficiencies in Vit C, Zinc, Copper, glycine, proline, lysine, B6, and avoid excessive NSAID use |
| **COMT**  (Catechol-O-Methyltransferase) | * Breaks down estrogen, catecholamines, and neurotransmitters (e.g., dopamine, epinephrine, norepinephrine) * Heterozygous or homozygous variants for COMT V158M methionine allele slow down COMT enzyme 🡪 affects in estrogen metabolism and breakdown of dopamine and stress hormones   + Valine variant catabolizes dopamine at up to 4x rate of methionine variant * Associated with breast cancer * Part of the pathway for estrogen metabolism * Genetic variances affect speed of genes, medications, suboptimal co-factors, stress, and high estrogen affect serotonin levels | * Wild Type: Highest catecholamine intake   + 2+ cups of coffee or green tea   + Higher intake for improved focus, concentration, executive function, mood, and polyphenol benefit * Heterozygous: Medium to low catecholamine intake   + 1-2 cups of coffee or green tea * Homozygous: Low catecholamine intake   + 1 cup of coffee or green tea   + Too much may lead to irritability, anxiety, impulsiveness | * Catecholamine Sensitivity * Catecholamines include barriers, bananas, cacao, citrus, coffee, green tea, black tea, and red wine   + Fruits have lower catecholamine load * “High impact gene” * Minimize chronic stress, high catecholamine intake, xenoestrogens, constipation, poor gut health, lead, and mercury * Relevant genotype: Homozygous * Shares a pathway with MAO-A * Gene for dopamine, estrogen, and epinephrine |
| **COMT**  (Wild Type) | * Associated with poor executive function, cognitive function and problem solving, and higher cardiovascular risk for those with depression * Works on estrogen, dopamine, and adrenaline | * Higher catecholamine intake, meditation, high intensity exercise * Pressure from deadlines and exercise with risk | * Minimize chronic stress, sugar, PPIs, aspartame, constipation, xenoestrogens, high homocysteine, high SAH, and mercury toxicity * Relevant genotype: Heterozygous AG and homozygous AA correlated with 30% reduction in dopamine receptor density in the striatum |
| **COMT**  (Heterozygous) | * Associated with anxiety, depression, impulsiveness, obsessive behavior, irritability, ADHD, and abnormal behavior * Works on estrogen, dopamine, and adrenaline | * Vitamin C * Magnesium * Copper * Smaller catecholamine intake * Weight training and sprint-based activities | * Minimize chronic stress, sugar, PPIs, aspartame, constipation, xenoestrogens, high homocysteine, high SAH, and mercury toxicity |
| **COMT**  (Homozygous) | * Associated with anxiety, depression, impulsiveness, obsessive behavior, irritability, ADHD, and abnormal behavior * Works on estrogen, dopamine, and adrenaline | * Vitamin C * Magnesium * Copper * Smaller catecholamine intake * Weight training and sprint-based activities | * Minimize chronic stress, sugar, PPIs, aspartame, constipation, xenoestrogens, high homocysteine, high SAH, and mercury toxicity |
| **COMT V158M**  (Dopamine Metabolism) | * Associated with cognitive health and mood * GG: Fast metabolizer   + Better response to high pressure situations with the ability to be more emotionally resistant and calm in a crisis   + Thrive in response to certain stressors with enhanced cognitive performance due to elevation of dopamine and adrenaline   + Perform well on tasks demanding cognitive flexibility, but not demanding focused attention   + Lower dopamine can affect executive function and problem-solving abilities   + Those with variants in ANKK1 also showed lowest cognitive performance   + 3x CV risk in Swedish population * Lower dopamine levels useful in threatening environments where maximal performance is required despite threat and pain * Increasing catecholamine intake   + Coffee, black tea, green tea, red wine, chocolate, citrus, bananas, berries, vanilla 🡪 slow down enzyme   + Meditation, Balanced Blood Sugar, Vit D, Omega-3-Fatty Acid, Fiber, High-intensity exercise, low media exposure   \*\* Those with depression may benefit from higher coffee and catecholamine intake.  \*\* Breast Cancer: green tea did not provide same beneficial effects   * Exercise with an element of risk * Balanced copper levels * AA: Slow metabolizer (3-5x decrease in enzymatic activity)   + 40% decrease in COMT enzyme activity   + Higher IQ, creativity, better memory, drive, reading comprehension, and overall cognitive function   + Body overreacts to stress 🡪 Anxiety impulsiveness, obsessive behavior, irritability (especially under stress), ADHD, abnormal behavior   + Combined with null genotype for GSTm1 or homozygous GSTP1 🡪 increased risk for developing postmenopausal breast cancer   + Higher estradiol levels and reduced estrogen clearance compared to wild type   + Higher sensitivity to xenoestrogens (BPA, phthalates) due to slowed enzyme function   + Higher sensitivity to lead (due to Vit. C depletion) and mercury levels * Higher dopamine useful in complex environments that require maximal performance in terms of memory and attention for survival * Low fiber * Magnesium * Eliminate xenoestrogen exposure * Vitamin C * Balanced Copper * Green tea for breast cancer protection (retaining polyphenols longer) * Lower dosages of catecholamines, quercetin, resveratrol … “Less is more” * Weight training and sprint activities 🡪 increase testosterone (speeds up COMT) and calms brain by assisting dopamine, adrenaline, and estrogen metabolism * AG: Intermediate metabolizer   + May experience traits like AA or GG depending on the environmental stressor   + Tend to be on the higher end of dopamine spectrum, with estrogen increasing levels more   + Score significantly better on insight and problem-solving tasks   + Greater effect for social facilitation and cooperativeness   + Body may overreact to stress and pressure that can lead to anxiety, depression, impulsiveness, obsessive behavior, irritability, ADHD, and abnormal behavior   + Higher sensitivity to catecholamines, especially in a stressed state – consumes less amount of alcohol   + Higher sensitivity to xenoestrogens (BA plastic, phthalates) due to slowing the enzyme down further   + Higher sensitivity to elevated lead (due to Vit. C depletion) and mercury levels) * Average-to-slightly higher dopamine, depends on environments, situation, and experience * Higher breast cancer protection from green tea intake (retain polyphenols longer) * Higher levels of magnesium and Vit. C needed to help breakdown and modulate elevated levels of dopamine and adrenaline * Balanced copper levels * Eliminate xenoestrogen exposure * Weight training and sprint activities 🡪 increase testosterone 🡪 COMT speeds up and calms the brain by assisting dopamine, adrenaline, and estrogen metabolism | | * Relevant Genotypes:   + GG (Warrior) – Wild-type   + AA (Worrier)   + AG (Mix: Warrior-Worrier) * Constipation and poor gut health can cause COMT enzyme to move slower, creating high estrogen, anxiety, and catecholestrogens for breast cancer risk * Wild type warriors associated with a higher level of anger and holding onto negative experiences, but have cognitive advantage as stress increases * Worries tend to score lower on science and social science exams, but have cognitive advantages over warriors in equal-stress-environments |
| **CoQ2** | * Associated with statin induced myopathy * Works on CoQ10 | * CoQ10 | * Relevant genotype: Homozygous * Avoid or minimize statin drugs |
| **CTH**  (Cystathionine Gamma-Lyase) | * Encodes enzyme in the trans-sulfuration pathway 🡪 conversion cystathionine derived from methionine into cysteine * Glutathione synthesis in the liver is dependent upon the availability of cysteine * Variants may increase the need for dietary cysteine   + Homozygotes for this gene also had significantly higher mean plasma homocysteine concentration * Associated with macular degeneration | * Increased by dietary factors * Animal foods (because they’re high in cysteine) * Lutein * Zeaxanthin * Bilberry * Lingonberry * Vitamin C & Vitamin E Supplements * DHA * Zinc | * Relevant genome: Homozygous * Minimize: Smoking, pesticides, benzene, aspartame, oxidative stress, obesity, and smoking |
| **CYP181 L432V**  (Estrogen Metabolism) | * Associated with elevated 4-hydroxyestradiol, potentially cancerous growth for breast prostate | * Rooibos tea * Celery * Parsley * Quercetin * Resveratrol | * Minimize high dose biotin, dioxins, OCPs, cigarette smoke, burning coal and vegetable oils * Relevant genotype: Wild type (GG) |
| **CYP1A1** | * Associated with breast cancer, prostate cancer, and lung cancer * Works on estrogen metabolism and benzyopyrene | * Iodine, Resveratrol, and green tea | * Relevant genotype: Heterozygous or homozygous * Minimize cigarettes, burning coal, and vegetable oils * Increased sensitivity to benzyoprene from smoking, especially with null genotype of GSTM1 |
| **CYP1A2** | * Determines if an individual is slow, intermediate, or fast metabolizer of caffeine * Metabolizer Types   + Slow: CC Genotype     - Caffeine may be a compounding risk factor     - Oral contraceptives prolong caffeine half-life (6.2 hours to 10.7 hours)     - Elevated fasting blood sugar from caffeine     - Over 4 cups of coffee may lower bone density in males     - Increased risk of nonfatal heart attacks       * Higher in those with heterozygous or homozygous COMT genes & slow CYP1A2   + Intermediate: AC genotype   + Fast: AA genotype * Associated with breast and prostate cancer | * Look at COMT V157M and CYP1A2 for coffee and green intake to determine catecholamine and caffeine metabolism * Wild type & Heterozygous:   + Coffee more protective with BRCA variants against breast cancer   + Associated with improved performance with caffeine for events over 1 hour * Homozygous:   + Coffee more protective against ER-positive breast cancer and prostate cancer survival   + Kombucha, marinades, cruciferous vegetables, berries, parsley, and spinach   + Associated with improved performance with caffeine for events under 1 hour * Heterozygous:   + Has no improved athletic performance from caffeine | * Avoid or minimize charred and fried meat, dioxins, nitrates, aflatoxin B1, ochratoxin A * Relevant Genotype:   + Wild type     - Minimize OCPs   + Heterozygous & Homozygous     - Minimize charred and fried meat, dioxins, nitrates, aflatoxin B1, and ochratoxin A |
| **CYP1B1 L432V** | * Elevated 4-hydroxyestradiol, potentially cancerous growth for the breast and prostate * Works on estrogen metabolism | * Rooibos tea * Celery, parsley, quercetin, and resveratrol | * Relevant genotype: Wild type (GG) * Minimize high dose biotin, dioxins * GG = Fast metabolizer is most sensitive to carcinogenic effects when Phase II detoxification is compromised |
| **CYP2C19**  (Estrogen Metabolism) | * Lower overall estrogen for the rapid metabolizer * Decreased risk of estrogen-receptor positive breast cancer | * Unknown | * Minimize drugs that inhibit CYP2C19 * Relevant genotype: Heterozygous or homozygous |
| **CYP2C19** | * Estrogen metabolism * Associated with decreased risk of estrogen-receptor positive breast cancer for rapid metabolizer | * Unknown | * Relevant genotype: Heterozygous or homozygous * Minimize drugs that inhibit CYP2C19 |
| **CYP2C9** | * THC metabolism * Associated with poor THC metabolism, potentially higher viral susceptibility when using THC | * Dosing lower THC if using | * Avoid or minimize THC (especially edible and vegetable oils) * Relevant genotype heterozygous or homozygous |
| **CYP2D6** | * Targets beta blockers, antidepressants, and opioids * Associated with poor metabolism of drugs that use CYP2D6 | * Unknown, further pharmacogenomic testing is recommended | * Relevant genotype heterozygous or homozygous * Further pharmacogenomic testing is recommended |
| **CYP2E1** | * Associated with colon cancer * Targets benzene, acrylamide 🡪 glycinamide * Targets alcohol, Tylenol, and nitrosamines | * Vitamin C * Garlic, Watercress, Ellagic acid, Dandelion * N-acetyl cysteine * Green tea, MTC Oil | * Minimize benzene, sodium benzoate, and fried foods * Relevant genotype heterozygous or homozygous |
| **CYP2R1**  (Vitamin D) | * Associated with breast and prostate cancer * Vitamin D protects against vascular disease, chronic inflammation and lower oxidative stress, and studies have found that low Vitamin D is associated with increased CV mortality   + High levels can lead to calcification and bone loss | * Check vitamin D levels | * Minimize pesticides * Relevant genotype: Heterozygous and homozygous |
| **CYP3A4**  (Estrogen Metabolism) | * Associated with elevated 16-alpha-OHE1 * Potentially cancerous growth for ovaries and prostate * Elevated 16-alpha-OHE1 | * Increase ratio to high 2-hydroxyesterone and low 16-alpha-OHE1 | * Minimize drugs that inhibit CYP3A4 and grapefruit juice combinations * Relevant genotype: homozygous and heterozygous |
| **CYPR21** | * Targets vitamin D * Associated with Vitamin D deficiency linked to muscle weakness, suboptimal muscle function, and stress fractures | * Vitamin D | * Relevant genotype: heterozygous or homozygous * Minimize Vit D levels < 20 |
| **DHFR** | * Folic acid sensitivity * Decreased gene function | * Methyl folate | * Minimize folic acid * Hetero/ Homozygous |
| **DI01**  (T3 & T4) | * Associated with pre-eclampsia, lung cancer, breast cancer, glioblastoma * Associated with blood clots | * Selenium * Zinc | * Minimize organochlorines * Relevant Genotype: Homozygous   + Wild type (CC) has lower T4   + Homozygous (AA) has higher T4 |
| **DI02**  (T3 & T4) | * Associated with mild hypothyroidism in the brain and potential link to bipolar disorder | * Selenium * Zinc | * Minimize organochlorines * Relevant Genotype: Homozygous |
| **ESR2**  (Estrogen receptor beta) | * Associated with breast and prostate cancer | * Breast: Phytoestrogens (e.g., flax seeds), Fermented soy, iodine * Prostate: Apigenin (e.g., celery, parsley), phytoestrogens (berries, beans, and sourdough bread), and iodine | * Minimize obesity, BPA, plastic, atrazine, dioxins, phthalates * Relevant genotype:   + Prostate: Heterozygous and homozygous   + Breast: Homozygous |
| **F5**  (Factor 5 Leiden Gene) | * Variants increase probability of blood clots * Risk of 2+ miscarriages or infertility problems is 2.5x greater in those with F5 gene | * Vitamin E supplement * Omega-3s (natural anticoagulant) | * Avoid NuvaRing and OCPs * Minimize elevated homocysteine levels * Variants( Hetero/Homozygous) may increase the probability of blood clots |
| **FAAH**  (Anadamide) | * Associated with anxiety, slower extinction of fear memories, and a heightened stress response to threatening situations | * Exercise >30min * Cacao * Genistein * Echinacea * Rosemary * Hops * Women: Red clover tea | * Relevant genotype: wild type * Minimize pesticides and phthalates |
| **FAAH**  (Anandamide = endogenous cannabinoid and neurotransmitter = “Bliss Molecule”) | * Encodes anandamide breakdown * Wild Type (CC): Encodes fast activity 🡪 lower anandamide 🡪 slower extinction of fear memories and heightened stress response to threatening situations * Heterozygous (CA): Intermediate genotype 🡪 balanced anandamide * Homozygous (AA): slow activity 🡪 higher levels of anandamide 🡪 reduction in anandamide-related anxiety and naturally higher levels of the “bliss” molecule 🡪 stimulated feelings of happiness * Rs324420 had less amygdala activation when placed in a threatening situation and decreased perception of situations to be threatening and respond with subjective feelings of apprehension and tension | * Endorphins 🡪 enhance cannabinoids   + Running and biking >30 minutes   + Strenuous hiking at high altitude * Stress reduction techniques   + Meditation, Yoga, Deep breathing * Avoiding pesticides * CBD oil * Red clover tea (women) * Kaempfero * Cacao * Genistein * Echinacea * 7-hydroxyflavone (parsley, onions, berries, tea, and citrus fruits) * Beta-caryophyllene (cloves, rosemary, hops) |  |
| **FADS2**  (Omega-3 Fatty Acids) | * Low omega-3 may affect breast, cognition, mood, and CV health * Modulates the pathway for breast and prostate health * Variants connected to poor conversion of plant-based ALA to EPA and DHA | * Animal based EPA and EHA * Omega-3 fatty acids 🡪 most important dietary measures for CV health | * Minimize high Omega-6 intake * Relevant genotype: Heterozygous or homozygous * Determines rate of conversion for ALA 🡪 EPA + DHA |
| **FTO**  (Ghrelin) | * Variants have shown higher ghrelin in many populations 🡪 increased appetite and potential for overeating * More prone to more abdominal obesity from saturated fat intake * Highly expressed in brain regions controlling feeding and energy expenditure * Risk factor for obesity (abdominal weight) | * Breakfast: protein and fiber-rich carbohydrates (especially pre-biotic fiber) = most effective at suppressing ghrelin levels throughout the day * Prebiotic fiber and bifidobacterial * 7-8 hours of sleep per night * Vitamin D * High-intensity or >1-hour aerobic exercise * If prone to overeating + abdominal weight gain, decrease saturated fat intake & increase polyunsaturated fat intake | * Minimize poor sleep, refined carbohydrate breakfast, and high saturated fat intake * Relevant genotype: Homozygous * High dietary saturated fat intake (>15.5% energy) and low dietary polyunsaturated fat intake further increased the risk of being overweight or abdominally obese for AA genotype. |
| **FUT2**  (Pre-biotic Fiber) | * Non-secretor rs602662 homozygous AA genotype found in European, African, and Indian populations * Rs1047781 (A385T) homozygous TT genotype has been shown to be potential functional variant associated with VitB12 and major FUT2 secretor defining SNP in East Asians   + Non-secretor type 🡪 Increased susceptibility to H. flu (pneumonia, meningitis, ear infections, bronchitis, blood stream infections, throat swelling, skin infections, & infectious arthritis), mumps, Candida, & autoimmune disorders * Non-secretor genotype confers resistance to certain infections including the Norovirus, Rotavirus, & H. Pylori (more susceptible) * Associated with lowered B12 levels | * Pre-biotic fiber increases bifidobacterial levels 🡪 increased GABA and folate production to balance glutamate and methylation, respectively   + Bananas   + Garlic   + Leeks   + Barley   + Asparagus   + Pistachios   + Onions   + Polyphenol-rich foods * Testing B12 levels   + Supplement if low * Vegan diet | * Non-secretor 🡪 higher B12   + Microbiome is different 🡪 Rarely colonized by several strains of probiotic Bifidobacteria   + May affect GABA levels for balancing glutamate * Heterozygous 🡪 intermediate B12 * Wild type 🡪 Low B12 * Poor gut flora dramatically disrupts serotonin and GABA * Homozygous FUT2 gene + antibiotics is most likely to affect serotonin and GABA |
| **GAD1**  Rs3749034 | * Converts glutamate to GABA * Variants (rs3828275 and re3791879) were associated with an increased risk for post-traumatic epilepsy occurring less than 1 week and between 1 week and 6 months post-head injury respectively * Associated with ADHD susceptibility contributing particularly to the hyperactive/ impulsive symptom domain * Conversion of glutamate to GABA | * B6, Taurine, Mg, Vitamin C, Lithium * Endurance exercise, yoga, meditation, deep sleep * DHA, Green tea, Low glycemic diet * Lion’s Mane Mushroom * Acetylcholine * Bifidobacterium longum * Intermittent fasting * Progesterone, Turmeric, Healthy testosterone + estradiol | * Relevant genotype: heterozygous or homozygous * May be connected to alcohol cravings * Avoid aspartame and MSG |
| **GATA3**  **Rs4143094** | * Associated with cellular maturation with proliferation arrest and cell survival and T cell development (specifically Th2) * Proposed function as a tumor suppressor gene in some types of cancer * Related to colon cancer for those eating processed meat compared to those with a normal genotype * Up regulated in ulcerative colitis |  | * Processed meat triggers a pro-turmeric inflammatory or immunological response * Heteo/homozygous |
| **GPX1** | * Associated with Hashimoto’s disease * Implicated with oxidative stress 🡪 hearing loss * Reduction in activity seen in newly dx/ untreated HTN patients 🡪 elevated hydrogen peroxide * Targets glutathione peroxidase | * Supplemental Selenium * Cold immersion post workout | * Minimize selenium deficiency, statin drugs, iron deficiency, and excess heat exposure * Variants associated with increased noise-induced hearing loss in mice * Relevant genotype: Homozygous |
| **GPX1**  (Glutathione Peroxidase 1) | * Encodes protein responsible for modulation and detoxification of hydroperoxides and hydrogen peroxide to protect the mitochondria and cytoplasm of cells against oxidative damage * Associated with Hashimoto’s disease, glioblastoma, meningioma, and melanoma | * Selenium in those with rs1050450 as it is lower in this allele group * Optimal testosterone and estrogen levels * Melatonin * Vitamin C and Vitamin E * Herbs, spices, and cold exposure | * Homozygous minor allele carriers of rs1050450 had lower GPX1 activity than other genotypes with the same selenium status * Minimize lead exposure as it is associated with glioblastoma and meningioma * Minimize selenium deficiency, iron deficiency |
| **GSTM1** | * Catalyzes the detoxification of alkyl polycyclic aromatic hydrocarbons (PAHs), intermediate forms of many carcinogens (specifically metabolically generated epoxide intermediates of benzo(a)pyrene * Deletion marker or “null status” for the absence of the GSTM1 protein   + Null genotype varies from 20-80% depending on ethnic group     - Less frequent in western and southern African and South American populations     - Intermediate in Japanese populations     - Higher in Egyptian, European, American, and Asian populations     - 80% found in Caucasian populations * Associated with cancer, endometriosis, T2DM, retinopathy, and recurrent pregnancy loss | * Cruciferous vegetables * Vitamin C, A, and E * Resveratrol * Curcumin * Green tea and white tea | * A>G forward strand = T>C strand * AA = Null * AG and GG = Present status * Impact of AA is low unless exposed to benzyo(a)pyrene exposure, slow acetylator of NAT2, smoking, or low cruciferous vegetable intake * High frequencies in patients with lung cancer, breast cancer, bladder cancer, colorectal cancer, skin cancer, chronic bronchitis, kidney disease progression, endometriosis, T2DM retinopathy, recurrent pregnancy loss * Minimize smoking, burning wood or trash, asphalt, coal, diesel, exhaust, gas cooking, dioxins, and grilled or charred meat * Phase II enzyme |
| **GSTP1**  (Glutathione) | * Children carrying rs1138272 or rs1695 minor alleles may constitute a susceptible population at an increased risk of asthma associated with air pollution * rs1695 associated with breast, prostate, urinary, esophagus, and skin cancer * rs1138272 associated with colon, prostate, lung, and throat cancer and infertility | * Vitamin E (a-tocopherol) supplementation in those with GG homozygous genotype   + Increases inflammation with AG or AA genotypes, so avoid Vitamin E | * Allelic variants of GSTP1 gene differ in susceptibility to various chemical carcinogens like glyphosate, air pollution, and heavy metal mercury * Early-stage breast cancer in those with rs1138272 polymorphism associated with docetaxel-induced peripheral neuropathy (x5 higher if BMI >30) * Rs1695 GG homozygous genotype associated with an increased risk of breast cancer, but not AG genotype * Relevant genotype: Homozygous or heterozygous |
| **GSTP1** | * Targets glutathione * Associated with higher VO2 max response | * N/A | * Relevant genotype: Heterozygous or homozygous |
| **GSTP1 rs1138272** | * Targets glutathione and heavy metals * Associated with colon, prostate, lung cancer, throat cancer, and infertility | * Glutathione precursors * Vitamin C * Magnesium * Alpha-lipoic acid * Holy basil | * Minimize mercury, arsenic, cadmium, pesticides, and air pollution * Relevant genotype heterozygous or homozygous |
| **GSTP1 rs1695** | * Targets glutathione and heavy metals * Associated with breast, prostate, urinary, esophagus, and skin cancer | * For Homozygous:   + Glutathione precursors, Holy Basil, Alpha Lipoic Acid   + Vitamin C, Vitamin E, Magnesium | * Minimize mercury, arsenic, cadmium, pesticides, and air pollution * Relevant genotype heterozygous or homozygous |
| **HFE**  (Iron) | * Associated with Hemochromatosis * In conjunction with C282Y and H63D, it works to down regulated iron absorption | * Low iron diet, cold climate, and increased herb and spice intake to boost antioxidant intake, and tea with meals | * Minimize supplemental Vitamin C and alcohol with meals * Relevant genotype: Homozygous C282Y |
| **HLADQ2.5** & **HLADQ8**  (Gluten) | * Associated with Celiac Disease | * Avoid gluten if other tests have confirmed Celiac Disease | * Minimize gluten * Relevant genotype: Heterozygous or homozygous |
| **HNMT**  (Heterozygous or homozygous) | * Targets histamine * Associated with DAO homozygous genotype that may | * Vitamin C, Choline, Folate, Mg, Chamomile, Basil, Stinging nettle, echinacea, fennel, ginger, wild oregano | * Minimize poor gut flora, aged foods, NSAIDs, antidepressants, histamine H2 blockers, antihistamines, antiarrhythmics |
| **HNMT**  (Wild type) | * Targets histamine * Associated with sensitivity to food dyes and sodium benzoate 🡪 exacerbated symptoms for those with ADHD | * Vitamin C, Choline, Folate, Mg, Chamomile, Basil, Stinging nettle, echinacea, fennel, ginger, wild oregano | * Minimize food dyes and sodium benzoate |
| **IL6** | * Targets muscle inflammation * Associated with higher CK levels post exercise | * Whey protein * Cold water immersion * Ginseng, Curcumin * Optimal testosterone levels * Vitamin C * Collagen protein | * Relevant genotype: Wild type * Minimize low testosterone (men), depression, obesity, and too few recovery days |
| **LCT**  (Lactose Metabolism) | * Lactose intolerance * Relevant Genotype: Wild type | * Avoid lactose * If eating dairy, eat aged cheeses | * Wild type connected to lactose intolerance in regions that did not introduce dairy (e.g., Northern Europe) |
| **Lp(a)** | * Sticky form of LDL appears to affect plaque growth, LDL particle size, and increases the risk of plaque rupture and blood clotting | * L-Carnitine has been found to possibly lower Lp(a) * Niacin reduces Lp(a) levels by 30-40% in a dose dependent manner 🡪 reduces LDL cholesterol, total cholesterol, TG, and raises HDL cholesterol | * Variation in the LPA gene determine plasma levels of Lp(a) * Carriers of apolipoprotein(a) variant had elevated Lp(a) and lowered their CV risk from low dose aspirin vs. non-carriers * Homo/Heterozygous |
| **MAO-A**  (Serotonin) | * Associated with depression in women with low estrogen * Breaks down important neurotransmitters   + Serotonin, Estrogen, NE, Dopamine * Monoamine Oxidase A | * B6, folate, B12, B2 * Mg, Vitamin C * Curcumin * Probiotics * Look at GG in context with COMT | * Relevant genotype: homozygous * Minimize nighttime pain relievers, antihistamines, sleep aids, antidepressants, incontinence drugs, and narcotic pain relievers * Relevant genotype:   + TT: Slow down * GG: Speed up |
| **MLH1**  **Rs1800734** | * Associated with colon cancer, endometrial cancer, glioblastoma, and lung cancer | * Diet rich in antioxidants and vitamins (especially folate) can alter DNA methylation and compensate for ROS-induced epigenetic lesions in MLH1 for patients with non-insulin dependent T2DM | * A allele promotes colorectal cancer progression by enhancing DCLK3   + potential oncogenic and tumor progressive factor * Minimize high fructose corn syrup, artificial sweeteners, MSG, caramel coloring, and other food dyes, phosphoric acid, sodas, sugar, white flour, and corn oil * Homozygous only |
| **MTHFD1** | * Decreased gene function with folate and choline deficiency * 1958 AA homozygous have 1.64x increased risk of unexplained 2nd trimester loss of pregnancy and increased likelihood for nonsyndromic cleft lip and palate in South Indian populations | * Higher need for folinic acid | * Minimize PPI, BC, NSAIDs, anticonvulsants, antivirals, antibiotics, and acid blocks/antacids |
| **MTHFR –**  -**1298, -677**  (BH4) | * Homozygous variants in both genes point towards higher need for methyl folate in diet to maintain healthy homocysteine levels * BH4 requires methyl folate for healthy nitric oxide levels * 677 and 1298 may be most susceptible to a high methionine intake, especially low folate intake * High animal protein diets increase methionine intake 🡪 Increase homocysteine levels but also produce higher amounts of ammonia * Targets folate * Associat4ed with higher folate requirements for nitric oxide | * Higher plant-based diet recommended for homozygous MTHFR 677, 1298, or compound heterozygous genotype centered around folate-rich foods, with adequate protein, but not high protein * Methyl folate, Vit C, Selenium, Mg, B6, and L-arginine all support BH4 | * Body stores ammonia as glutamate, compounding issues with GAD1 and BDNF gene * Minimize PPIs, OCPs, NSAIDs, anticonvulsants, antivirals, antibiotics, and hypothyroidism * Relevant genotype:   + Homozygous for 1298   + Heterozygous and homozygous for 667 |
| **MTHFR A128C** | * Not linked to homocysteine unless both heterozygous 1298 and 677 are present * Associated with lower levels of tetrahydrobiopterin BH4   + Associated with mental health due to low levels of serotonin, melatonin, dopamine, NE, and epi * Associated with elevated homocysteine levels | * Increased folate in heterozygous, especially if also have MTHFRC677T heterozygous * B2 * Methyl folate | * Heterozygous 1298: reduced function of 20% * Homozygous 1298: reduced function of 40% * Normalizing BH4 can lead to serotonin levels and digestive function normalizing * Minimize chronic stress, mercury, arsenic, lead, Al, folic acid, phenylalanine, aspartame, oxidative stress, high protein diets |
| **MTHFR C677T** | * Converts methyl folate to 5-MTHF * Regulates homocysteine levels * Associated with lower levels of tetrahydrobiopterin BH4   + Associated with mental health due to low levels of serotonin, melatonin, dopamine, NE, and epi * Associated with elevated homocysteine levels | * B2 * Methyl folate | * Homozygous and heterozygous variants slow enzyme down * Homozygous is advantageous against malaria * Minimize PPI, BC, NSAIDs, Anticonvulsants, antivirals, antibiotics, acid blockers/antacids, and hypothyroidism |
| **MTNR18**  (Melatonin) | * Associated with elevated glucose levels from late dinners, late night snacks, and early morning breakfast | * Dinner before 7pm * No late night snacks * Breakfast after 7:30am | * Minimize dinner or snacks past 7pm, breakfast before 7:30am, melatonin supplementation * Relevant genotypes: Heterozygous and homozygous |
| **MTR/MTRR** | * Associated with poor FUT2 function * GG phenotype of MTRR associated with neural tube defects, down syndrome, CAD, male infertility, and cancer through sustained hypomethylation * Helps recycle B12 | * Betaine * Choline * B6 * B12 * Folate | * Minimize excess alcohol, excess sugar, anesthesia, BC, and heavy metals / Antacids, antibiotics, proton pump inhibitors, Metformin, anticonvulsants, BC, psychiatric medications, yeast overgrowth * Homozygous mostly, unless FUT SNPs present |
| **NAT2** | * Targets aromatic amines * Associated with breast, bladder, and prostate cancer | * Cruciferous Vegetables * Unfiltered fermented drinks * Meat and fish marinades * Parsley * Vitamin C | * Relevant genotype homozygous * Minimize smoking, commercial hair dyes, industrial and manufacturing plants, charred meat, and diesel exhaust |
| **NBPF3**  (B6) | * Associated with anorexia, irritability, anxiety, depression, muscle pain, bad PMS/low progesterone, nausea, seizures, migraines, dementia, ovarian cancer, and AMD | * Supplement with B6 | * Minimize sugar, stress, alcohol, refined carbohydrates, antibiotics, and oral contraceptives * Relevant Genotype: Heterozygous or homozygous |
| **NBPF3** | * Targets B6 * Associated with higher B6 requirements for collagen and homocysteine | * B6 supplementation | * Relevant genotype heterozygous or homozygous * Minimize sugar, stress, alcohol, refined carbohydrates, antibiotics, and OCPs |
| **NF-kB** | * Protein complex that controls transcription of DNA, cytokine production, and cell survival * Inhibit and help modulate helper T-cell proliferation | * Zinc, Selenium, Magnesium, Resveratrol * Vitamin D, Vitamin C * Triterpenoids (chaga, reishi, olive oil, holy basil) * Caffeic acid (coffee, chaga, red wine, elderberry) * Anthocyanins (elderberry, gogi berries, and cacao) | * Ensuring helper T-cells are regulating 🡪 inflammation control to prevent viral replication and opportunistic bacteria |
| **NOS1** | * Connected to central and peripheral neurons * Possibly linked to cancer growth * Role in regulation of the serotonin pathway, HPA axis, and psychological stress | * NOS 1: Carotenoids, polyphenols, and DHA * BH4 supplement if levels are low | * BH4 is slower in CSF of children with ASD * Minimize psychological stress and pesticides |
| **NOS2** | * Connected to central and peripheral neurons * Possibly linked to cancer growth * Role in regulation of the serotonin pathway, HPA axis, and psychological stress | * NOS 2: L-arginine, seaweed, whey protein, cordyceps | * Significant interaction between smoking and NOS SNP rs2248814 * Minimize smoking, heavy metals, vegetable oils, high blood sugar, high acidity, and poor breathing habits |
| **NOS3** | * Connected to endothelial cells, keeping blood vessels dilated, and controlling BP * Has anti-atherosclerotic effects |  |  |
| **PEMT** | * Associated with alterations in the dietary requirement for choline and increased the likelihood of developing signs of defiance (fatty liver, gallbladder issues during pregnancy) when choline intake is inadequate * Estrogen can induce gene encoding catalyzing the production of phosphatidylcholine in the liver * Associated anxiety, poor memory, poor REM sleep | * Betaine and choline * Vitamin C | * Minimize nighttime pain relievers, antihistamines, sleep aids, antidepressants, incontinence drugs, and narcotic pain relievers * Relevant genotype: Heterozygous or homozygous |
| **PON1** | * Sensitivity with higher fat and salt diet for CV health in those with Asian ancestry * Hypothesis: Decreased levels of PON1 🡪 increased circulating oxidized LDL & reduce capacity of PON1-mediated inhibition of LDL-C oxidation | * Increase a variety of plant compounds, selenium, omega 3’s, and small amounts of alcohol * Diet high in potassium and low in salt * Influenced positively by multiple dietary factors (alpha-lipoic acid, gamma-linolenic acid, Vitamins E, B1, B2, B5, B6, selenium, olive oil, broccoli spouts, and polyphenols) | * C allele of PON1 is also “R” allele in research studies is connected to atherosclerosis and heart disease * Decreased PON1 🡪 higher limit of homocysteine * Hetero/homozygous |
| **PPAR-Alpha**  (Fasting & Saturated Fat) | * Vital role in fatty acid metabolism & ketosis 🡪 considered most crucial targets for ameliorating abnormalities with TG, HDL, LDL, VLDL, + ApoB * Variants in this gene have been found to have a poor response to fasting due to low ketone bodies 🡪 genotype may explain diverse reactions to ketogenic diet * Variants have lower CRP levels * Activation has also been demonstrated to inhibit tumor growth and angiogenesis, reduction in body mass, and treats insulin resistance and NAFLD | * PPAR-Alpha agonists active the gene 🡪 uptake, utilization, + breakdown of fatty acids.   + Also demonstrated to inhibit tumor growth & angiogenesis, reduction in body mass   + Treats insulin resistance + non-alcoholic fatty liver * Decreasing saturated fat + increasing polyunsaturated fats, astaxanthin, pterostilbene, genistein, tomatoes, cinnamon, zinc, Lion’s Mane mushroom, Gynostemma tea, and L-carnitine all activate PPAR-alpha gene expression and improved TG levels, LDL particle size, and weight. | * Variants may be more sensitive to saturated fat intake and poor lipid profiles * PPAR-alpha agonists all activate PPAR-alpha gene expression and improved triglyceride levels, LDL, particle size, and weight * Homo/ Heteozygous |
| **PPAR-Alpha** (Ketones) | * Associated with low ketone bodies and abnormalities with TG, HDL, LDL, VLDL, ApoB | * Lower fasting times * Consistent intake of foods that stimulate the PPAR-alpha gene * 3 meals and snacks throughout the day * Decreasing saturated fat and increasing polyunsaturated fats, astaxanthin, pterostilbene, genistein, tomatoes, cinnamon, zinc, Lion’s Mane | * Avoid Ketogenic Diet * Relevant Genotype: Heterozygous or homozygous |
| **PPARGC1A** | * Targets VO2 Max * Associated with lower VO2 Max | * Ashwagandha * Eluethero root * Cold exposure | * Relevant genotype: Heterozygous or homozygous |
| **PPCDC**  (Serum Zinc) | * Associated with reduced immune function | * Zinc supplement | * Minimize medications that deplete zinc * Relevant genotype: Heterozygous or homozygous |
| **SCL17A7** | * Targets Glutamate uptake * Associated with negatively affecting concussion recovery | * Zinc, Omega-3 fatty acids, magnesium * B Vitamins and Vitamin C * Lion’s mane mushroom * Exercise | * Relevant genotype: homozygous * Minimize: head injuries |
| **SCL23A1** | * Targets Vitamin C * Associated with higher Vitamin C requirements for collagen and recovery | * Vitamin C | * Relevant genotype: heterozygous or homozygous * Minimize: smoking, alcohol, sugar, illness, antibiotics, aspirin, and environmental toxins * Homo/Heterozygous |
| **SCLC23A1**  (Serum Vit. C) | * Associated with low immunity | * Vitamin C supplement | * Minimize smoking, excess alcohol, sugar, illness, antibiotics, cortisone, aspirin, environmental toxins, heavy metals, and chemotherapy |
| **SELENBP1**  (Serum Copper) | * Associated with reduced immune function | * Copper supplement | * Minimize medications that deplete copper * Relevant genotype: heterozygous or homozygous |
| **SHBG**  (Fructose) | * Synthesized in the liver & blood * Transports & regulates access of sex steroids to target tissues * Low Levels associated with Hypothyroid, T2DM, fatty liver, & obesity   + Very low levels = Biomarker | * Lower fructose intake * Women: Low-fat + high-fiber diet + exercise 🡪 reduction in insulin, BMI, and increased SHBG * Extremes of SHBG levels can lead to problems with hormones   + Variants correlated with different base SHBG levels   + Influenced by diet * Negative influence = Fructose + refined carbohydrates | * The SHBG levels in AA homozygotes for rs1799941 were 39% higher than in GG wild-type in post-menopausal women. Subjects with the A allele (GA+AA) for rs1799941 had a trend for a lower free estradiol index compared to the GG genotype. They also had a significantly lower bone mineral density (BMD) at the intertrochanter of the hip and a trend for lower BMD at the total hip. |
| **SHBG rs6258** | * Sex hormone binding globulin for men * Associated with low testosterone * Alters estrogen levels 🡪 altered serotonin   + Especially if intake is low and sugar/refined carbohydrate intake is high * Synthesized in the liver * Regulates access of sex steroids to their target tissues | * Magnesium * Zinc * Vitamin D * Omega-3 * Boron * Higher healthy fat intake * Weightlifting | * Minimize high fructose, corn syrup, agave, crystalline fructose, low fat, and high fiber diets * Relevant genotype: heterozygous and homozygous * CC variants have lower testosterone, calculated free testosterone, and SJBG in men   + GT and TT have higher levels |
| **SIRT1** | * Regulates numerous genes that accelerate the aging process, modulate DNA repair mechanisms and transcription factors (e.g., Tp53, FOXOs, NF-kb) * Activation induced |  | * Activity decreases as we age 🡪 accumulation of DNA damage * Activity harmed by sedentary lifestyle, poor diet, and obesity * Homo/heterozygous when combined with APOE4 |
| **SLC17A7**  (Glutamate uptake) | * Associated with poor head injury recovery | * Zinc * Omega-3 * B vitamins and Vit C * Lion’s mane mushroom * Mg * Exercise | * Relevant genotype: Homozygous * Minimize head injuries |
| **SLC22A5** (OCTN2)  (L-Carnitine) | * Polymorphisms may result in shortage of carnitine, affecting fatty acid travel to mitochondria | * Lysine, Mg, Vitamin C = Major precursors of L-carnitine production 🡪 Mg-Rich nuts and seeds good sources of fat * MCT Oil does not require acetylcarnitine transferase to cross the inner mitochondrial membrane = excellent fat if carnitine deficient | * Not tested due to lack of ongoing research |
| **SOD2**  (Prostate) | * Associated with aggressive prostate cancer and muscle inflammation * Lycopene increases risk for aggressive prostate cancer for homozygous genotype * Manganese-dependent * Protects against superoxide for the mitochondria * Colitis linked to impaired SOD2 * Men with homozygous allele had higher risk of aggressive prostate cancer * Last line of protection against glutamate toxicity * Reduction in activity seen in newly dx/ untreated HTN patients 🡪 elevated hydrogen peroxide | * Lycopene and other antioxidants * Manganese for heart health, blood sugar, male fertility, bone health, and protecting the brain against glutamate toxicity * Lactobacillus for those with Colitis * Fluoride decreases SOD activity, can use reverse osmosis systems to remove from water * Vitamin A, C, + E, Omega-3, Fatty Acids, Cordyceps, Reishi help protect mitochondria * Minimize or avoid drugs that block glutamate transporters   + Causes inner retinal neurons to be exposed to a higher amount of endogenous glutamate 🡪 severe excitotoxic degeneration * Lutein, Zeaxanthin, Carotenoids, Antioxidant, Boron, Holy Basil, Reishi * Cryotherapy | * Minimize low lycopene intake and heavy training without enough recovery days * Relevant genotype: homozygous * Rs4880 G allele 🡪 reduce efficiency against oxidative stress * GG genotype 🡪 increased levels of muscle and liver damage, higher values of LDH, CK, CK-MD, troponin, and myoglobin compared to wildtype (AA) or AG * Exogenous glutamate considered weakly toxic to retinal neurons and removal of glutamate from extracellular space is critical for maintenance of retinal function preventing retinal neurons against glutamate toxicity |
| **SOD3 r213G**  (Zinc/Copper Superoxide Dismutase) | * Major antioxidant enzyme system of the vessel wall of cardiovascular system and lungs * Protects cell membrane from inflammation * Associated with asthma | * Choline (protect cell membrane) * Balance Zinc-Copper ratio * Vitamin C and Vitamin E * CoQ10 * Carotenoids | * Ideal ratio 8:1 to 12:1 Zinc:Copper * Relevant genome: heterozygous or homozygous * Minimize vegetable oils, fried foods, toxins, antacids, PPIs, antibiotics, and OCPs |
| **TC7FL2**  (Incretin, Fiber & Refined Carbohydrates) | * Strongest indicator of T2DM & GDM 🡪 risk for multiple ethnicities with normal BMI & TG * Unique relation to T2DM * Increased risk hypothesized due to sensitivity to pancreatic beta-cells to incretins, but not overall insulin sensitivity | * Sufficient protein 🡪 management of T2DM by stimulating incretin, insulin secretion, & slowing gastric emptying. * Incretins stimulated by glycine, omega-3-fatty acids, olive oil, turmeric, cinnamon, organic dark roast coffee, and cordyceps mushrooms * Microbiome:   + Kombucha   + Sauerkraut   + Kimchi   + Yogurt | * Coronary & obese patients 🡪 Higher fasting glucose, post-challenge glucose, and HbA1c than CC homozygous * Hypothesized sensitivity of pancreatic B-cells to incretins * Elevated serotonin / disrupted serotonin signaling 🡪 depression * Minimize sugar and refined carbohydrates * Relevant Genotype: heterozygous or homozygous |
| **TCN2**  (B12) | * Associated with Ulcerative Colitis, low concentrations of holotranscobalamin, and high homocysteine | * Dietary lithium | * Minimize depleted lithium levels and very high circulating B12 levels * Relevant genotype: homozygous |
| **TFR1**  (Iron) | * Used in combination with HFE variants for iron overload | * Low iron diet, cold climate, and increased herb and spice intake to boost antioxidant intake, and tea with meals | * Minimize supplemental Vitamin C and alcohol with meals * Relevant genotype: Wild type |
| **TMAO**  (trimethylamine N-oxide) | * Precursor of dimethylnitrosamine * Generated from choline, betaine, and carnitine * Higher amounts 🡪 increased risk of CV disease * Candidate in mediating development of T2DM * Connected to red meat consumption to higher levels of CV disease | * Omega-3 fatty acids * Choline * Assess ESR2 and F5 gene | * TMAO generated by the gut microbiome exacerbates impaired glucose tolerance, inhibits hepatic insulin signaling, and promotes adipose tissue inflammation in mice * Poor kidney function reported to cause elevated TMAO levels * Minimize high-fat, high-sugar diet * Relevant with PEMT, FADS1,FADS2 snps |
| **TMPRSS2**  (Prostate) | * Associated with prostate cancer | * Lycopene * Phytoestrogens * Curcumin | * Minimize smoking and low phytoestrogen intake * Relevant genotype: wild type |
| **TMPRSS2** | * Expression is several times higher in the prostate, upper digestive, and respiratory tract, compared to other tissue |  | * Can decrease expression via increased phytoestrogens, curcumin, and lycopene (tomato sauce) |
| **TNFA**  (Tumor Necrosis Factor-Alpha) | * Pro-inflammatory cytokine * Variants may increase the risk of asthma in Asian populations | * Those with the A allele benefit from cordyceps, Vitamin C, turmeric, and ginger 🡪 lowered TNFA levels * Traditional Okinawa Diet | * Role in Lung Health * AG or AA allele had increased risk of asthma compared to GG carriers * Homo/heterozygous in Asian populations |
| **Tp53** | * Tumor Suppression * Associated with Hashimoto’s disease | * Vitamin C * Niacin * Reishi * Zinc * Selenium | * Wild type points towards ancestry closer to the equator with diets high in plant intake * Minimize:   + Excessive sun exposure in females   + Occupational chemical exposure * Relevant genotype: heterozygous or homozygous |
| **VOKRC1\*2** | * Associated with arterial calcification, osteoporosis, breast cancer, and poor dental health * Targets Vitamin K2 * Polymorphisms may increase the need for Vitamin K2 | * Vitamin K2   + MK4 found in pastured eggs, grass-fed butter, meat, and numerous cheeses     - Targets sex hormones, brain, anti-cancer + anti-inflammatory activity, and bone health   + MK7 found in natto, certain cheese, and goose liver     - Considered better for reducing arterial calcification, increasing bone density, anti-cancer, improves salivary buffering, and increasing cardiac output in athletes * Prebiotics and probiotics | * Minimize long-term use of anticoagulants and statin drugs * Relevant genotypes heterozygous or homozygous * Increases sensitivity to Warfarin dosing and Vitamin K recycling |

**Abbreviation Key**:

Al = Aluminum

ASD = Autism Spectrum Disorder

ARMD = Age Related Macular Degeneration

BC = Birth Control / Hormonal Contraceptive

BP = Blood Pressure

CAD = coronary artery disease

CK = Creatinine Kinase

CNS = Central Nervous System

CRP = C-reactive protein

CV = Cardiovascular

GDM = Gestational Diabetes Mellitus

GI = Gastrointestinal

HDL = High Density Lipoprotein

HTN = Hypertension

IBS = Irritable Bowel Syndrome

LDL = Low Density Lipoprotein

LPL = Lipoprotein Lipase

Mg = Magnesium

NAFLD = Non-alcoholic fatty liver disease

NE = Norepinephrine

OCP = Oral Contraceptive Pill

PPI = Proton Pump Inhibitor

T2DM = Type Two Diabetes Mellitus

TB = Tuberculosis

TG = Triglycerides

VLDL = Very Low-Density Lipoprotein