
Your Genetic Report

Prepared for

Prepared by  **Optimal**
by **LIV** NORTH

Recommendation Summary

Recommendation for Metabolic

You have lower levels of adiponectin and altered leptin sensitivity, slowing your metabolic rate and encouraging adipogenesis, the formation of fat from food. You also have increased ghrelin stimulating hunger and food seeking behaviour. You have a slightly slower thermogenic rate (burning of fat for fuel) with a significant increased risk of weight gain, particularly when consuming saturated fats and refined carbohydrates.

Intermittent Fasting would be ideal for you, as a small daily fasting period will help boost adiponectin levels and increase fatty acid oxidation. In addition, you require less caloric intake than other genetic codings, making this an ideal way to eat. The easiest way to implement intermittent fasting is to withhold food for 16 hours a day and then having 2 meals within an 8 hours. The second meal must be completed before the start of the 16-hour fast.

The timing of meals during the 8-hour feeding period is up to you. You may choose breakfast and a late lunch, or an early lunch and dinner. If you need a small snack in between the two meals within the 8-hour feeding window, you may. But do not consume excess calories just because it is a feeding window.

You would greatly benefit from this for an 8-week period, at which point you could switch back to 3 meals a day, no snacking, leaving 5 to 6 hours of fasting in between the meals. Alternatively you can easily maintain Intermittent Fasting.

During fasting periods or between meals, you may have water, coffee and tea (caffeinated or caffeine free) with a small amount of milk or milk substitute but nothing over 25 to 30 calories. You also need to keep saturated fats and simple refined sugars very low in the diet. (this exact number is calculated by carb and fat genes)

TMC (Tri Metabolic Control) by Douglas Labs – 2 caps twice a day 30 mins or more before meals for 8 weeks to significantly reduce ghrelin, increase adiponectin and regulate leptin, boosting the metabolism as well as significantly reducing hunger and food cravings, allowing you to stick to your genetic diet with ease. Then rotate this in 1 week out of every 4 to 6 weeks.

Recommendation for Carbohydrates

You are sensitive to carbohydrates. You make more insulin substrates to destabilizing blood sugars much more readily significantly increasing weight gain upon carbohydrate consumption. You do not produce many inflammatory substrates in your GI track following carbohydrate consumption, helping to reduce the impact on the bowel and stomach.

Keep grains, starches, fruits or alcohol (see list of these carbohydrates to moderate below) to a maximum of 2 meals per day, where the physical size of the carbohydrate is half the physical size of the protein for 8 weeks. After 8 weeks, this can increase to 3 meals per day. Do not use sweets as your carbohydrate on a regular basis, save that as a treat.

Keep healthy vegetables such as broccoli, zucchini, peppers and cauliflower, as your main carbohydrate source. You can consume unlimited quantities of these vegetables and salads, avoiding the starchy ones below.

Carbohydrates to moderate:

Grains: breads, pastas, rice, corn, popcorn, quinoa, legumes, muffins, crackers etc

Starches: potato, sweet potato, yam, squash, carrot, beets, turnip etc

Fruits: all fruits except the tomato, berries are the best choice

Alcohol: wine, spirits, beer etc

Sweets: cakes, pastries, cookies, candy, soda pop, hot chocolate etc

Metabolic Xtra By Pure Encapsulations or Berb-Evail by Designs for Health – 1 capsule 30 minutes before meals for 8 weeks if blood sugars are unstable.

Recommendation for Protein

You need the average amount of protein per meal. You require 0.8 to 1 gram of protein per kilogram of body weight divided by 3. This will give the the amount of protein you need per meal. Eg. A 165 lb individual is 75 kg. That would be equal to approximately 23 grams of protein per meal.

You are the ideal candidate for Intermittent Fasting, as fasting will help boost adiponectin levels and you require less caloric intake than other codings. Fasting for 16 hours a day and feeding for 8 hours a day is ideal. You may have water, coffee and tea (caffeinated or caffeine free) with a small amount of milk or milk substitute but nothing over 25 to 30 calories. You also need to keep saturated fats and simple refined sugars very low in the diet. (this exact number is calculated by carb and fat genes). Ideally you would do this for at least 8 weeks. If you wish to return to 3 meals a day, no snacks, leaving 5-6 hours in between meals following the 8 weeks, you may.

Ideal protein sources include:

- Pure Paleo Protein Powder by Designs for Health
- Dream Protein by Promedics
- Fish
- Poultry
- Egg whites
- Greek Yogurt - lower fat - check your dairy genes
- Cottage Cheese - lower fat - check your dairy genes
- Non GMO tofu products

Recommendation for Fats

Upon the consumption of saturated fats, you release slightly more ghrelin, the hunger hormone, which can increase food seeking behaviour and food cravings, especially for energy dense foods such as sweets and fats. You also have an alteration in the production of adiponectin and leptin, your 2 main metabolic hormones that play a key role in the rate of your metabolism, but also in the regulation of blood sugar and insulin levels, the desire to snack, especially after 6 pm, your ability to break down stored fat, and inflammatory responses in the body. In addition, your body readily increases the size and number of fat cells, a process known as adipogenesis. These metabolic effects are greatly stimulated and enhanced only when consuming more than 28 grams of saturated fat per day.

Treatment is to reduce dietary intake of saturated fats to less than 28 grams per day. Some simple changes that can be made to lower saturated fat intake and maintain poly and mono unsaturated fats include consuming almonds and walnuts over most other nuts, using fat free dairy products such as yogurt and cottage cheese, using almond or avocado oil and eliminating coconut oil, and consuming more poultry and fish versus red meat. Below is a chart comparing saturated fat levels in several common foods.

Food Source | Saturated Fat

- 1 tbsp MCT oil | 14 grams
- 1 oz or 28 grams raw almonds | 1 gram
- 1 oz walnuts | 1.7 gram
- 1 oz cashews | 2.5 grams
- 1 oz macadamia nuts | 3.5 grams
- 3 oz grilled salmon | 2.1 grams
- 3 oz chicken skinless breast | 2.2 grams
- 3 oz beef | 3.5 grams
- 1/2 cup of 2% cottage cheese | 2 grams
- 1/2 cup of 0% cottage cheese | 0 grams
- 3/4 cup 0% greek yogurt plain | 0 grams
- 3/4 cup 2% greek yogurt | 3.5 grams
- 1 oz cheddar cheese | 9.4grams
- 1 oz brie | 8 grams
- 1 large egg | 2 grams
- 1 oz milk chocolate | 5 grams
- 1 oz dark chocolate | 9 grams
- 1 tbsp of olive oil | 1.9 grams
- 1 tbsp of canola oil | 7 grams

1 tbsp of coconut oil | 13 grams

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Pure Lean Fiber by Pure Encapsulations – 1 scoop per day in water at a meal with higher saturated fat to bind the fat to the fiber for excretion and prevent absorption of the fat.

Recommendation for Dairy

You have normal lactase persistence. Your small intestinal cells have retained the ability to continue to produce lactase, the enzyme to break down lactose in dairy products.

You do not need to stay away from dairy products.

Recommendation for Dopamine

You make less dopamine and produce fewer dopamine receptors to bind this lower concentration of dopamine. You also clear dopamine out quickly, decreasing the length of time dopamine has to stay bound into a receptor and have an effect.

This greatly increases the risk for addictive type behaviours such as gambling, over training in sports, eating, and shopping. You may also have a greater desire for fattier foods such as chips, cheese, nuts and alcohol.

This combination of genes is associated with seeking out more pleasure or reward, whether from food, sex or extreme sports. It requires “greater highs” to “satisfy” the brain.

You also may find holding focus and concentration for prolonged periods of time difficult.

To help increase dopamine production naturally you can take **FocusPlus by Pure Encapsulations** - 1 capsule twice a day empty stomach (30 minutes or more before food or 2 hours or more after food).

When craving a food or behaviour try one minute of jumping jacks or similar exercise to boost dopamine quickly and naturally and help cut through the craving.

Regular exercise, according to your genetics is key to maintain balanced dopamine levels.
Moderate stress through deep breathing, meditation, diet and your stress hormone genes.

Recommendation for Serotonin

You make significantly less serotonin in both the brain and the intestines and your transportation of serotonin out of the bowel to its target tissues is greatly compromised. In addition, you metabolize or clear out serotonin quickly decreasing the length of time serotonin can remain bound into a receptor exerting its effect. However, your clearance of your stress hormones is equally fast, decreasing their ability to impair serotonin production further.

This genotype combination can greatly increase the risk for depression, low moods, waking at 5 am or early morning waking, gastro-intestinal bloating, irregular bowel movements, muscle pain and swelling, and food cravings, particularly for chocolate or sweets.

Treatment is **SeroPlus by Pure Encapsulations** -2 capsules twice a day with food.

Regular exercise, according to your genetics is key to maintain balanced serotonin levels.

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Moderate stress through deep breathing, meditation, diet and your stress hormone genes.

Recommendation for Short Term Stress Response

You produce the normal amount of ACTH from the pituitary and cortisol from the adrenal glands for each stressor. You also have the normal number of hypothalamic receptors for mineralocorticoids to help shut off the HPA axis and return the nervous system to the quiet parasympathetic side.

In addition, your clearance of stress hormones through your COMT gene is fast, helping to decrease the length of time these stress hormones can bind and impact the nervous system.

However, you produce a higher level of FKBP5, the binding protein that regulates glucocorticoid binding and sensitivity, impairing the negative feedback regulation of the HPA axis.

All of this slightly increases the risk of anxiety depression, PTSD, hyperactivity, panic attacks and exaggerated emotional responses.

Treatment is **Sereniten Plus by Douglas Labs** 1 capsules twice a day empty stomach (30 minutes or more before food, or 2 hours or more after) for 4-6 weeks and then reduce to 1 capsule a day empty stomach (30 minutes or more before food, or 2 hours or more after) increasing as needed for periodic stressors that occur.

Deep breathing and meditation.

Exercise according to your exercise genes.

Recommendation for Long Term Stress Response

You produce the normal amount of corticotropin releasing hormone (CRH) from your hypothalamus for each stressful event you encounter. This helps return your central nervous system back to the parasympathetic side, the quiet side, with greater ease following a stressful event. You also have the normal amount of CRH receptors with which to maintain parasympathetic stimulation.

In addition, your clearance of stress hormones through your COMT gene is fast, helping to decrease the length of time these stress hormones can impact the nervous system.

However, you produce a high level of FKBP5, the binding protein that regulates glucocorticoid binding and sensitivity, impairing the negative feedback regulation of the HPA axis and keeping your nervous system stuck for longer periods of time in the sympathetic stress side.

All of this allows the central nervous to get "stuck" in the sympathetic side with slightly greater ease, increasing risk of anxiety depression, PTSD, hyperactivity, panic attacks and exaggerated emotional responses.

Treatment is **Sereniten Plus by Douglas Labs** 1 capsules twice a day empty stomach (30 minutes or more before food, or 2 hours or more after) for 4 weeks after completing treatment for your short term stress response and then reduce to 1 capsule a day empty stomach (30 minutes or more before food, or 2 hours or more after), increasing as needed for periodic stressors that occur.

Deep breathing and meditation.

Exercise according to your exercise genes.

Recommendation for Cardiovascular

You have approximately equal distribution of fast and slow twitch fibers in your muscles. Fast twitch fibers enable one to sprint, and slow twitch fibers allow one to preform endurance exercises. As you have a mix between the two, you are best designed for a combination of moderated sprints and longer slower endurance.

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You also have an increased blood flow in large quick bursts to the muscle during exercise and a better control of sodium-potassium regulation within the cells. In addition, you have more beta-2 adrenergic activity with increased bronchodilation with short intense exercise. Both of these effects further moderate your exercise style slightly towards faster sprints or HIIT (High Intensity Interval Training).

You are better with 1.5 to 2 minute intervals at 70-75% capacity, with 45 second recovery intervals at 40% capacity for 45-50 minutes twice a week. Alternating with a consistent cardiovascular workout for 45-60 minutes at about a 60% capacity twice a week.

Recommendation for Resistance Training

You are designed for light weight, high repetition resistance training. You produce the normal amount of angiotensin converting enzyme or ACE, and thus have a good flush of blood volume over the muscle body during exercise, with adequate control of your sodium potassium pumps for repair from exercise.

The C variant allele coding for the INSL2 gene is associated with an increased in subcutaneous weight fat deposition in both men and women, which is increased further when performing heavy weight, fewer repetition resistance training. This is even more prominent in men.

Treatment. Make your weight training more like a cardiovascular workout. Use light weights and multiple reps (15-20 reps) with little to no breaks in between exercises. Aim to do exercises that recruit more muscle groups at once. Eg, with light weights perform a shoulder press from a squat position, standing up at the same time as you perform your shoulder press to engage both the legs and the arms in one exercise. Repeat for 15 to 20 repetitions and then move straight into your next exercise. Aim for sets of each exercise 2 to 3 times a week.

Recommendation for Injury Susceptibility and Prevention

You have a significant increased risk of injury when exercising, especially when performing high intensity interval training, stop-start sports or lifting heavy weights. You produce an increased amount of metalloproteases, the enzymes that are involved in the breakdown and remodelling of collagen (especially collagen type 1, 11, 1V, 1X and X) as well as increasing the breakdown of the main components of connective tissue, the proteoglycans, fibronectin, laminin and elastin, greatly compromising not just the strength but also the elasticity and resistance of tendons under stress or during exercise. You also produce more than the normal amount of IL6, a potent inflammatory substrate when you exercise, augmenting inflammation in the tendons and joints as well as increasing weight gain.

However, you do produce more collagen type 1 protein helping to increase the strength and integrity of your collagen type 1, the main collagen type in most tendons and ligaments.

Treatment: Warming up with a walk before exercise is key to increase the blood flow and oxygen into muscles so that they are more flexible and can stretch with greater ease when you do exercise, decreasing the pressure and stress on the attached tendons. Avoid plyometrics and stop-start sports such as soccer as much as possible. Use K-tape around the Achilles tendon or any weaker joint to support the muscles and increase proprioception and nerve firing to the muscle. This once again will allow the muscle to function with greater response, decreasing the stress placed on the tendons. Always ice after exercise.

Resveratrol Extra by Pure Encapsulations– 1 capsule twice a day empty stomach (30 minutes or more before food or 2 hours or more after) to reduce the excess production of MMPs and IL6. After 6 weeks this can reduce to 1 per day.

Arthroben by Designs for Health - 1.5 tablespoons a day in water to rebuild collagen and decrease inflammation.

Report

MC4R
rs17782313

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The MC4R gene codes for the proteins that make up the Melanocortin-4 receptor in the hypothalamus of the brain. This receptor has a central role in satiety and controlled food intake. When stimulated by the agonist neuropeptide alpha-MSH (alpha melanocyte stimulating hormone) it reduces hunger, improves sensitivity to satiety signals, promotes meal termination and increases metabolism, fat burning and thermogenesis. The MC4R receptor, therefore, plays a pivotal role in the control of food intake, energy expenditure and weight homeostasis.

Mutations in the structure of the MC4R receptor have a profound impact on hunger, food intake, energy metabolism and adiposity. Animals with MC4R receptor mutations show hyperphagia, delayed meal termination and reduced sensitivity to satiety feedback peptides such as CCK. They also demonstrate metabolic abnormalities including reduced insulin sensitivity, impaired thermogenesis and lowered overall metabolic rate. Similar findings are seen in humans with a number of mutations of varying effect and penetrance associated with obesity and metabolic syndrome.

The melanocortin system is interesting in that it is one of the few neuroendocrine systems that have a natural antagonist, in this case AgRP (Agouti-Related Peptide). This messenger binds to the receptor and turns it off, which results in hunger, food seeking behaviour, lowered metabolism and weight gain.

Normal Allele: T **Variant Allele:** C

You are: CT

Key Characteristics of the Variant Allele:

- Each C allele is associated with an 8% increase in obesity.
- CC's can increase body weight by up to 43% independent of diet and exercise.
- Decreased satiation of appetite.
- Increased food seeking behaviour and desire to snack.
- Increased association with emotional overeating.
- Greater stress-related cravings for processed foods.
- Rapid weight gain on antidepressants and antipsychotics.
- Increased insulin resistance and a 14% increase in risk for type-2 diabetes.
- Hypogonadism
- Decreased libido

ADIPOQ
rs17366568

The ADIPOQ gene codes for the 244-amino acid protein Adiponectin, circulating in high concentrations in the blood of genetically normal individuals. Adiponectin is a bioactive, fat cell-derived hormone (adipokine) produced primarily in adipose tissue. It is also processed in smaller quantities in bone marrow, the cardiovascular system, the liver and muscle mass. It increases insulin sensitivity partially by suppressing glucose production, as well as increasing fatty acid oxidation and regulating glucose and insulin levels. It regulates healthy fat storage while preventing accumulation of lipids in other tissues (liver, muscle, arteries etc.) and has a strong cardio-protective role.

Adiponectin inhibits damaging inflammatory pathways, increasing endothelial NO (Nitrous Oxide) production and inhibiting oxidative stress. Adiponectin deficiency is associated with increased damage during cardiac ischemic events.

Reduced fat mass or weight loss increases adiponectin, promoting glucose and fatty acid uptake into adipocytes. Adiponectin reduces the production of cholesterol and glucose by the liver to help control metabolic syndrome. Overall it has a profound effect on the storage and use of fat as an energy source and extensive research indicates that it prevents the development of metabolic syndrome disorders such as diabetes. Circulating levels are significantly lower in patients with obesity, diabetes, hypertension and coronary artery disease and research shows that adiponectin can reverse insulin resistance and will likely provide a novel treatment approach for Type 2 diabetes.

This ADIPOQ gene codes for the production of adiponectin **during weight loss**, as opposed to during weight maintenance or when you deviate from your genetic dietary program.

Normal Allele: G **Variant Allele:** A

You are: GG

Key Characteristics of the Variant Allele:

- Lower circulating adiponectin during weight loss
- Slower rate of weight loss
- Increased overall weight gain and BMI
- Unstable blood sugars, insulin levels
- More food cravings
- Food cravings disappear or lessen with calorie deprivation
- Weight loss increases with calorie deprivation

ADIPOQ rs17300539

The ADIPOQ gene codes for the 244-amino acid protein Adiponectin, circulating in high concentrations in the blood of genetically normal individuals. Adiponectin is a bioactive, fat cell-derived hormone (adipokine) produced primarily in adipose tissue. It is also present in smaller quantities in bone marrow, the cardiovascular system, the liver and muscle mass. It increases insulin sensitivity partially by suppressing glucose production, as well as increasing fatty acid oxidation and regulating glucose and insulin levels. It regulates healthy fat storage while preventing accumulation of lipids in other tissues (liver, muscle, arteries etc.) and has a strong cardio-protective role.

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This ADIPOQ gene codes for the production of adiponectin **during weight maintenance** or when deviating from your genetic dietary program.

Normal Allele: A **Variant Allele:** G

You are: GG

Key Characteristics of the Variant Allele:

- Regains weight easily after weight loss
- Yo-yo dieter.
- More unstable glucose and insulin during weight maintenance
- Increased weight and BMI
- Increased food cravings during weight maintenance.
- Symptoms decrease with caloric restriction.

ADRB2 rs1042714

The ADRB2 gene, or the beta-2 adrenergic receptor is widely expressed in most cell types and is the primary target of catecholamines (stress hormones) during the stress response. It plays a significant role in a myriad of responses from controlling heart rate to blood pressure, mood, food cravings, response to exercise and energy balance in the metabolism.

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The ADRB2 receptor regulates the metabolism through the stimulation of both thermogenesis (conversion of fat into heat for energy) and in lipid mobilization or breakdown for fuel. The variance in the gene is greatly associated with increased obesity, BMI and lipogenesis (formation of fat from food). The effects are greatly augmented with the consumption of sugars and fats.

As this gene functions through the sympathetic nervous system, variant coding is also associated with higher levels of anxiety, panic attacks or increased anger and stress eating.

Normal Allele: C **Variant Allele:** G

You are: GG

Key Characteristics of the Variant Allele:

- Increased sensitivity to carbohydrates and saturated fats
- Slower metabolic rate
- Decreased weight loss with endurance exercise
- Increased BMI
- Increased serum lipids
- Increased blood sugars and insulin
- Increased blood pressure
- Increased production of inflammatory cytokines (TNF and IL10)
- Altered leptin production and thus increased food cravings and slower metabolism
- Decreased thermogenesis
- Loose more weight on calorie reduced diet.

PPAR_γ
rs1801282

Peroxisome proliferator-activated receptor gamma (PPAR-gamma) plays a central role in fatty acid and glucose metabolism as well as in fat storage and insulin sensitivity. It is found mostly in adipose tissue, but is also seen in the vascular endothelium, colon and in macrophages.

The receptor is the target for the TZD (thiazolidinediones) class of diabetic medications. The gene product has several different metabolic functions and has thusly been coined the master regulator of adipocyte biology. It works by modifying the transcription of a number of genes involved in glucose and lipid metabolism, fat cell differentiation and energy balance.

PPAR_γ also has an anti-inflammatory effect on the endothelial cells of the cardiovascular system and reduces the development of atherosclerosis. Its effect on inflammation may be even more widespread with some studies indicating an association with conditions such as rheumatoid arthritis. PPAR_γ inhibits the expression of inflammatory cytokines such as TNF-α and IL-6, and directs the differentiation of immune cells towards anti-inflammatory phenotypes. Both synthetic and natural PPAR_γ activators are currently under investigation for their potential as anti-inflammatory agents.

PPAR_γ is shown to be an important factor in fat cell differentiation. The process of adipogenesis involves the development of adipocyte precursor cells into functioning fat cells capable of filling them with lipids and expressing adipokines such as leptin and adiponectin. It has also been shown to promote the browning of white fat, a beneficial process that increases metabolism and fat burning and combats obesity.

Normal Allele: C **Variant Allele:** G

You are: CC

Key Characteristics of the Variant Allele:

- Lower BMI
- Improved insulin sensitivity
- Reduced risk of Type 2 diabetes.
- Worse on a high fat and high carbohydrate diet
- Significant cumulative effect when combined with FTO, ADIPOQ, MC4R and ADRA SNPS.
- Good response in weight loss with caloric reduction.
- Have greater health benefits from exercise.
- Lower heart disease risk.
- Higher risk of complications in patients that develop diabetes
- Increased weight gain, if the individual becomes overweight.

FTO
rs9939609

FTO, the Fat Mass and Obesity-Related Protein, colloquially known as the “Fatso” gene, codes for the enzyme alpha-ketoglutarate-dependent dioxygenase. It was one of the first metabolic genes identified, and research into its clinical and lifestyle implications is extensive.

Approximately 42% of Caucasians, 5% of Africans and 21% of Asians carry the risk allele (A). This risk allele in large scale population studies accounts for an overall 1% increase in BMI and a 22% increased risk of obesity, *independent of* diet and exercise. However, the effect is significantly worse if an FTO-A individual consumes a low protein, high saturated fat or high calorie diet as the expression of the A allele is further enhanced with such nutrition.

The variant allele A is associated with alterations in 3 main metabolic hormones. The first is elevated ghrelin production. Ghrelin is our hunger hormone, and elevated levels cause increased food cravings, especially for energy dense foods such as sugars and saturated fats.

The second is adiponectin (see ADIPOQ genes), a hormone that increases insulin sensitivity and fatty acid oxidation and regulates both insulin and glucose levels thereby preventing the accumulation of lipids in the body. Reduced levels promote glucose and fatty acid uptake into fat cells, increase metabolic syndrome and obesity.

The third is leptin, our satiety hormone that reduces hunger and food seeking behaviour. Leptin decreases lipogenesis, the formation of fat and increases triglyceride hydrolysis and fatty acid oxidation. Leptin also helps to stimulate thermogenesis, or the browning of white fat to increase weight loss. Leptin resistance which is seen more frequently in the variant A allele leads to increased fat stores, food cravings, particularly after 6 pm and the inability to use fat as a fuel source.

The variant allele also has reduced levels of the proteins IRX3 and IRX5. These proteins promote the formation of unhealthy white fat over beneficial, fatty acid burning, brown fat by a factor of 5.

All of these variables are altered by the amount of protein, sugars and saturated fats consumed. Each genotype requires a specific amount of protein to control the hormone production.

Normal Allele: T **Variant Allele:** A

You are: AT

Key Characteristics of the Variant Allele:

- Increased production of Ghrelin, the “hunger hormone”.
- Decreased Adiponectin, increased fat storage.
- Reduced Leptin sensitivity, increased food cravings.
- Reduced levels of proteins IRX3 and IRX5, decreased brown fat formation.
- Increased insulin and glucose.
- Decreased thermogenesis.
- Increased obesity and BMI.

Recommendation for Metabolic

You have lower levels of adiponectin and altered leptin sensitivity, slowing your metabolic rate and encouraging adipogenesis, the formation of fat from food. You also have increased ghrelin stimulating hunger and food seeking behaviour. You have a slightly slower thermogenic rate (burning of fat for fuel) with a significant increased risk of weight gain, particularly when consuming saturated fats and refined carbohydrates.

Intermittent Fasting would be ideal for you, as a small daily fasting period will help boost adiponectin levels and increase fatty acid oxidation. In addition, you require less caloric intake than other genetic codings, making this an ideal way to eat. The easiest way to implement intermittent fasting is to withhold food for 16 hours a day and then having 2 meals within an 8 hours. The second meal must be completed before the start of the 16-hour fast.

The timing of meals during the 8-hour feeding period is up to you. You may choose breakfast and a late lunch, or an early lunch and dinner. If you need a small snack in between the two meals within the 8-hour feeding window, you may. But do not consume excess calories just because it is a feeding window.

You would greatly benefit from this for an 8-week period, at which point you could switch back to 3 meals a day, no snacking, leaving 5 to 6 hours of fasting in between the meals. Alternatively you can easily maintain Intermittent Fasting.

During fasting periods or between meals, you may have water, coffee and tea (caffeinated or caffeine free) with a small amount of milk or milk substitute but nothing over 25 to 30 calories. You also need to keep saturated fats and simple refined sugars very low in the diet. (this exact number is calculated by carb and fat genes)

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Diet Carbohydrates

GIPR rs2287019

GIPR or gastric inhibitory polypeptide receptor, also called glucose-dependent insulinotropic polypeptide, is an important peptide hormone that is synthesized in the duodenum and small intestine and binds to glucose-dependant insulinotropic peptide receptors or GIP's after a meal rich in carbohydrates.

GIPRs are abundant in a variety of tissues including the pancreas, adipocytes, brain and stomach, and thus GIP signalling is involved in a variety of pathways linked to obesity, insulin resistance and type 2 diabetes.

Some of the major roles of GIPR include the inhibition of gastric acid secretions and gastrin release, but more importantly stimulates insulin release in the presence of elevated glucose following carbohydrate consumption. The variant T allele of this gene presents with higher blood glucose levels and impaired insulin secretion following carbohydrate ingestion increasing the risk of obesity and diabetes.

Normal Allele: C **Variant Allele:** T

You are: CC

Key Characteristics of the Variant Allele:

- Increased GIPR production and activity.
- Increased insulin resistance
- increased glucose levels
- increased obesity
- increased abdominal fat
- increased BMI
- increased risk of Type 2 Diabetes

TCF7L2 rs7903146

TCF7L2 or transcription factor 7 like 2 is a gene that alters the expression of other genes that control insulin after the consumption of carbohydrates and saturated fats (but mostly carbohydrates). It is involved in the Wnt signalling pathway, a group of signalling transduction pathways that pass signals into cells via their surface receptors.

This is known as the largest risk factor gene for glucose regulation, insulin production as well as inflammation in the colon upon the consumption of carbohydrates. Variance (T allele) within this gene greatly increases blood glucose and insulin levels significantly increasing weight and BMI. It also has impaired beta cell function (pancreatic cells that release insulin) following carbohydrate consumption further impacting weight and blood glucose regulation.

This is one of 2 TCF7L2 SNPs reported to be associated with type 2 diabetes. Both have equal power (92% correlation) to estimate the risk of T2DM.

Normal Allele: C **Variant Allele:** T

You are: CT

Key Characteristics of the Variant Allele:

- Increased weight, BMI following carbohydrate consumption and saturated fat intake.
- Altered glucose and insulin levels
- Increased risk of type 11 diabetes by 2-fold for homozygote variants and heterozygotes have a 1.4 fold increase.
- Increased risk for metabolic syndrome.
- Increased abdominal adiposity
- Increased colon cancer

IRS1 rs2943641

Insulin receptor substrate 1 (*IRS1*) is a ligand of the insulin receptor tyrosine kinase and is central to the insulin receptor signal transduction pathway. IRS1 is the major protein initiating the stimulation of glucose transport in both muscle and adipose tissue. In addition, this protein plays a key role in the insulin signalling through body tissues. Deregulation in *IRS1* expression and function has been reported in insulin-resistant states such as obesity and type 2 diabetes.

More specifically, the IRS1 gene makes the protein IRS-1 that binds to insulin and IGF-1 receptors. This binding then causes phosphorylation which then in turn activates a multitude of signalling pathways, many of those involving glucose and insulin regulation.

Variance within this gene cause an increase in glucose uptake contributing to obesity, type 2 diabetes, insulin resistance and triglyceride formation upon carbohydrate consumption.

IRS1 is also involved in the P13K pathway. P13K or phosphatidylinositol 3-kinase is part of a family of enzymes involved in cellular functions such as cellular growth, proliferation, differentiation, and motility, all of which are turned on in cancer. This specific pathway of PI3K and IRS-1 is involved in insulin and glucose insensitivity of cancerous tumours as well as altered benefits of calorie restriction on the tumours.

Normal Allele: T **Variant Allele:** C

You are: CT

Key Characteristics of the Variant Allele:

- Decreased IRS1 protein production.
- Increased insulin resistance
- Increased glucose levels
- Increased obesity
- Increased risk of Type 11 Diabetes
- Increased risk of Metabolic Syndrome
- Increased risk of cancers – colorectal, lung, prostate and breast

Recommendation for Carbohydrates

You are sensitive to carbohydrates. You make more insulin substrates to destabilizing blood sugars much more readily significantly increasing weight gain upon carbohydrate consumption. You do not produce many inflammatory substrates in your GI track following carbohydrate consumption, helping to reduce the impact on the bowel and stomach.

Keep grains, starches, fruits or alcohol (see list of these carbohydrates to moderate below) to a maximum of 2 meals per day, where the physical size of the carbohydrate is half the physical size of the protein for 8 weeks. After 8 weeks, this can increase to 3 meals per day. Do not use sweets as your carbohydrate on a regular basis, save that as a treat.

Keep healthy vegetables such as broccoli, zucchini, peppers and cauliflower, as your main carbohydrate source. You can consume unlimited quantities of these vegetables and salads, avoiding the starchy ones below.

Carbohydrates to moderate:

Grains: breads, pastas, rice, corn, popcorn, quinoa, legumes, muffins, crackers etc

Starches: potato, sweet potato, yam, squash, carrot, beets, turnip etc

Fruits: all fruits except the tomato, berries are the best choice

Alcohol: wine, spirits, beer etc

Sweets: cakes, pastries, cookies, candy, soda pop, hot chocolate etc

Metabolic Xtra By Pure Encapsulations or Berb-Evail by Designs for Health – 1 capsule 30 minutes before meals for 8 weeks if blood sugars are unstable.

Diet Protein

FTO
rs9939609

FTO, the Fat Mass and Obesity-Related Protein, colloquially known as the “Fatso” gene, codes for the enzyme alpha-ketoglutarate-dependent dioxygenase. It was one of the first metabolic genes identified, and research into its clinical and lifestyle implications is extensive.

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Approximately 42% of Caucasians, 5% of Africans and 21% of Asians carry the risk allele (A). This risk allele in large scale population studies accounts for an overall 1% increase in BMI and a 22% increased risk of obesity, *independent of* diet and exercise. However, the effect is significantly worse if an FTO-A individual consumes a low protein, high saturated fat or high calorie diet as the expression of the A allele is further enhanced with such nutrition.

The variant allele A is associated with alterations in 3 main metabolic hormones. The first is elevated ghrelin production. Ghrelin is our hunger hormone, and elevated levels cause increased food cravings, especially for energy dense foods such as sugars and saturated fats.

The second is adiponectin (see ADIPOQ genes), a hormone that increases insulin sensitivity and fatty acid oxidation and regulates both insulin and glucose levels thereby preventing the accumulation of lipids in the body. Reduced levels promote glucose and fatty acid uptake into fat cells, increase metabolic syndrome and obesity.

The third is leptin, our satiety hormone that reduces hunger and food seeking behaviour. Leptin decreases lipogenesis, the formation of fat and increases triglyceride hydrolysis and fatty acid oxidation. Leptin also helps to stimulate thermogenesis, or the browning of white fat to increase weight loss. Leptin resistance which is seen more frequently in the variant A allele leads to increased fat stores, food cravings, particularly after 6 pm and the inability to use fat as a fuel source.

The variant allele also has reduced levels of the proteins IRX3 and IRX5. These proteins promote the formation of unhealthy white fat over beneficial, fatty acid burning, brown fat by a factor of 5.

All of these variables are altered by the amount of protein, sugars and saturated fats consumed. Each genotype requires a specific amount of protein to control the hormone production.

Normal Allele: T **Variant Allele:** A

You are: AT

Key Characteristics of the Variant Allele:

- Increased production of Ghrelin, the "hunger hormone".
- Decreased Adiponectin, increased fat storage.
- Reduced Leptin sensitivity, increased food cravings.
- Reduced levels of proteins IRX3 and IRX5, decreased brown fat formation.
- Increased insulin and glucose.
- Decreased thermogenesis.
- Increased obesity and BMI.

Recommendation for Protein

You need the average amount of protein per meal. You require 0.8 to 1 gram of protein per kilogram of body weight divided by 3. This will give the the amount of protein you need per meal. Eg. A 165 lb individual is 75 kg. That would be equal to approximately 23 grams of protein per meal.

You are the ideal candidate for Intermittent Fasting, as fasting will help boost adiponectin levels and you require less caloric intake than other codings. Fasting for 16 hours a day and feeding for 8 hours a day is ideal. You may have water, coffee and tea (caffeinated or caffeine free) with a small amount of milk or milk substitute but nothing over 25 to 30 calories. You also need to keep saturated fats and simple refined sugars very low in the diet. (this exact number is calculated by carb and fat genes). Ideally you would do this for at least 8 weeks. If you wish to return to 3 meals a day, no snacks, leaving 5-6 hours in between meals following the 8 weeks, you may.

Ideal protein sources include:

Pure Paleo Protein Powder by Designs for Health

Dream Protein by Promedics

Fish

Poultry

Egg whites

Greek Yogurt - lower fat - check your dairy genes

Cottage Cheese - lower fat - check your dairy genes

Non GMO tofu products

Diet Fats

FABP2 rs142649876

Fatty acid binding protein 2 is one of a group of proteins that plays a key role in the absorption and intracellular transport of long chain fatty acids. It is produced primarily in the small intestines and is encoded by the FABP2 gene. Fatty acids are the building blocks of lipids or fats and are classified according to the number of carbon atoms in their chains or tails. Long chain fatty acids are those with 14 or more carbon atoms. They are also classified according to the number of hydrogen bonds into saturated, monounsaturated or polyunsaturated. These fats can be found in foods as variable as dairy fat, coconut oil, olive canola and safflower oil, fish oils, nuts and avocado. They include both healthy and unhealthy fats with the nutritional value determined by a number of structural factors including length and saturation.

Fatty acids are key for energy production (ATP production). When compared to other macronutrients such as carbohydrates or proteins, fatty acids yield the most APT on an energy per gram basis. This is why fatty acids are the foremost storage form of fuel in humans, animals and to a lesser extent plants.

The variant A allele has twice the affinity for long chain fatty acids and therefore increases their absorption and processing. This results in increased fatty acid oxidation leading to insulin resistance and increased risk of type 11 diabetes.

G/G – no increased sensitivity to saturated fats and sugars

G/A – moderate sensitivity to saturated fats and sugars – approximately 25%

A/A – approximately double the sensitivity to saturated fats and sugars.

Normal Allele: G Variant Allele: A

You are: GG

Key Characteristics of the Variant Allele:

- Increased weight gain + BMI with > 53 grams of saturated fats and/or refined sugars per day.
- Increased glucose levels.
- Increased insulin resistance.
- Increased risk of Type 2 diabetes
- Increased risk of hyperlipidaemia in Type 2 (but NOT Type 1) diabetes
- Increased fatty acid uptake and delivery to tissue – by 2 fold
- Lower HDL
- Higher total cholesterol
- All above turned on when consuming > 53 grams of saturated fat and/or refined sugars.

FTO rs9939609

FTO, the Fat Mass and Obesity-Related Protein, colloquially known as the “Fatso” gene, codes for the enzyme alpha-ketoglutarate-dependent dioxygenase. It was one of the first metabolic genes identified, and research into its clinical and lifestyle implications is extensive.

Approximately 42% of Caucasians, 5% of Africans and 21% of Asians carry the risk allele (A). This risk allele in large scale population studies accounts for an overall 1% increase in BMI and a 22% increased risk of obesity, *independent* of diet and exercise. However, the effect is significantly worse if an FTO-A individual consumes a low protein, high saturated fat or high calorie diet as the expression of the A allele is further enhanced with such nutrition.

The variant allele A is associated with alterations in 3 main metabolic hormones. The first is elevated ghrelin production. Ghrelin is our hunger hormone, and elevated levels cause increased food cravings, especially for energy dense foods such as sugars and saturated fats.

The second is adiponectin (see ADIPOQ genes), a hormone that increases insulin sensitivity and fatty acid oxidation and regulates both insulin and glucose levels thereby preventing the accumulation of lipids in the body. Reduced levels promote glucose and fatty acid uptake into fat cells, increase metabolic syndrome and obesity.

The third is leptin, our satiety hormone that reduces hunger and food seeking behaviour. Leptin decreases lipogenesis, the formation of fat and increases triglyceride hydrolysis and fatty acid oxidation. Leptin also helps to stimulate thermogenesis, or the browning of white fat to increase weight loss. Leptin resistance which is seen more frequently in the variant A allele leads to increased fat stores, food cravings, particularly after 6 pm and the inability to use fat as a fuel source.

The variant allele also has reduced levels of the proteins IRX3 and IRX5. These proteins promote the formation of unhealthy white fat over beneficial, fatty acid burning, brown fat by a factor of 5.

All of these variables are altered by the amount of protein, sugars and saturated fats consumed. Each genotype requires a specific amount of protein to control the hormone production.

Normal Allele: T **Variant Allele:** A

You are: AT

Key Characteristics of the Variant Allele:

- Increased production of Ghrelin, the "hunger hormone".
- Decreased Adiponectin, increased fat storage.
- Reduced Leptin sensitivity, increased food cravings.
- Reduced levels of proteins IRX3 and IRX5, decreased brown fat formation.
- Increased insulin and glucose.
- Decreased thermogenesis.
- Increased obesity and BMI.

APOA2 rs5082

The APOA2 gene encodes for apolipoprotein A2, which is the second most abundant high-density lipoprotein in the body (Apolipoprotein A1 is the most prevalent). Apolipoproteins A1 and A2 are the major protein components of high-density lipoproteins or HDL's, the "good cholesterol" that removes excess bad cholesterol (LDL) from the blood and reduces atherosclerosis and cardiovascular disease risk.

APOA2 influences the regulation of several key enzymes in lipoprotein metabolism including hepatic lipase. It also affects cholesterol ester transfer proteins, phospholipid transfer proteins, serum glucose, free fatty acid and insulin levels. Of great importance is that it plays a significant role in modulating the body's response to dietary saturated fat.

The association between the variant allele of the APOA2 gene, high BMI and a high fat diet is one of the strongest examples of gene-diet interactions. A mean increase in BMI of 6.2% is seen in C/C (or G/G) versus C/T (A/G) or T/T (A/A) individuals when consuming equally high amounts of saturated fat exceeding 22 grams per day. This association is of particular importance in societies with abundant food and food high in fat content (such as a typical western diet).

Normal Allele: A **Variant Allele:** G

You are: AG

Key Characteristics of the Variant Allele:

- Reduced APOA2 transcription
- Increased BMI when consuming a high saturated fat diet (>22g per day)
- Increased visceral body fat and waist circumference.
- Increased hunger and desire for energy dense foods resulting from increased ghrelin levels.
- Lower efficiency of fat absorption following a meal.
- Faster clearance of fats from the bloodstream.
- Lower levels of cholesterol, triglycerides, cholesterol-HDL ratio.
- Lower risk of cardiovascular disease.
- No apparent association with Type-2 diabetes

Recommendation for

Fats

Upon the consumption of saturated fats, you release slightly more ghrelin, the hunger hormone, which can increase food seeking behaviour and food cravings, especially for energy dense foods such as sweets and fats. You also have an alteration in the production of adiponectin and leptin, your 2 main metabolic hormones that play a key role in the rate of your metabolism, but also in the regulation of blood sugar and insulin levels, the desire to snack, especially after 6 pm, your ability to break down stored fat, and inflammatory responses in the body. In addition, your body readily increases the size and number of fat cells, a process known as adipogenesis. These metabolic effects are greatly stimulated and enhanced only when consuming more than 28 grams of saturated fat per day.

Treatment is to reduce dietary intake of saturated fats to less than 28 grams per day. Some simple changes that can be made to lower saturated fat intake and maintain poly and mono unsaturated fats include consuming almonds and walnuts over most other nuts, using fat free dairy products such as yogurt and cottage cheese, using almond or avocado oil and eliminating coconut oil, and consuming more poultry and fish versus red meat. Below is a chart comparing saturated fat levels in several common foods.

Food Source | Saturated Fat

1 tbsp MCT oil	14 grams
1 oz or 28 grams raw almonds	1 gram
1 oz walnuts	1.7 gram
1 oz cashews	2.5 grams
1 oz macadamia nuts	3.5 grams
3 oz grilled salmon	2.1 grams
3 oz chicken skinless breast	2.2 grams
3 oz beef	3.5 grams
1/2 cup of 2% cottage cheese	2 grams
1/2 cup of 0% cottage cheese	0 grams
3/4 cup 0% greek yogurt plain	0 grams
3/4 cup 2% greek yogurt	3.5 grams
1 oz cheddar cheese	9.4grams
1 oz brie	8 grams
1 large egg	2 grams
1 oz milk chocolate	5 grams
1 oz dark chocolate	9 grams
1 tbsp of olive oil	1.9 grams
1 tbsp of canola oil	7 grams
1 tbsp of coconut oil	13 grams

TMC (Tri Metabolic Control) by Douglas Labs – 2 caps twice a day 30 mins or more before meals for 8 weeks and then cycle this in 1 week out of 4 to 6 weeks to significantly reduce ghrelin, increase adiponectin and regulate leptin, boosting the metabolism as well as significantly reducing hunger and food cravings, allowing you to stick to your genetic diet with ease.

Pure Lean Fiber by Pure Encapsulations – 1 scoop per day in water at a meal with higher saturated fat to bind the fat to the fiber for excretion and prevent absorption of

the fat.

Diet Dairy

MCM6
rs4988235

MCM6 is the gene that controls whether or not the LCT gene produces lactose. The MCM6 gene provides instructions for making part of the MCM complex, a group of proteins that form a helicase. A helicase is a group of enzymes that binds to and remodels DNA.

There is a specific DNA sequence within the MCM6 gene that controls the regulation or expression of a nearby gene called LCT, the lactose gene, which provides instructions for making lactase to breakdown lactose. The MCM6 gene controls the turning on or off of the LCT gene and thus the production of lactase.

Lactose cannot be broken down in the small intestines nor absorbed through the GI tract in its whole form. It must be broken down or digested by lactase into glucose and galactose.

Undigested lactose can cause a myriad of symptoms from gas, bloating, abdominal pain to diarrhea and nausea.

Lactose intolerance is the result of a deficiency of lactase, and there are 4 main types. Primary lactose intolerance occurs with age, where there is a natural decrease in enzyme production. This type of intolerance does not cause damage to the gastro-intestinal tract. Secondary lactose intolerance is due to injury in the small intestines such as infection, celiac or IBS. Developmental lactose intolerance can occur in premature infants, and often improves with age or time. And the rarest form, congenital, whereby little to no lactase is made right from birth.

Normal Allele: A Variant Allele: G

You are: AA

Key Characteristics of the Variant Allele:

- Decreased lactase persistence.
- Decreased lactase production from childhood into adulthood.
- Increased lactose intolerance.
- Increased gas, bloating and nausea.

Recommendation for Dairy

You have normal lactase persistence. Your small intestinal cells have retained the ability to continue to produce lactase, the enzyme to break down lactose in dairy products.

You do not need to stay away from dairy products.

Neurotransmitters

Short Term Stress Response

COMT
rs4680

COMT or Catechol-O-methyltransferase is an important enzyme produced by the COMT gene that degrades or metabolizes several catecholamines including dopamine, adrenaline and noradrenaline (epinephrine and norepinephrine), along with estrogens and certain drugs. This enzyme adds a methyl group that is donated by SAME (S-adenosylmethionine) and is thus also a major methylation gene.

COMT is extremely active in the prefrontal cortex, the area in the brain that is responsible for cognitive behaviour, decision making, personality expression, learning, addictions and moderating much of social behaviour.

Increased COMT activity decreases the binding and activity along with increasing the clearance of dopamine, adrenaline, noradrenaline, and catechol estrogens by almost 50%.

With respect to the clearance of dopamine through this gene, the normal allele is considered the adverse position, for it has a faster clearance of dopamine.

Normal Allele: G Variant Allele: A

You are: GG

Key Characteristics of the Variant Allele:

- Decreased COMT activity.
- Increased dopamine leading to less addictive behaviour, less food cravings.
- Increased pleasure responses following a stimuli.
- Increased anxiety due to higher stress hormone levels
- Often called the Worrier (as opposed to the G allele referred to as the warrior).
- More obsessive-compulsive behaviours.
- Increased fear response associated with PTSD.

FKBP5
rs3800373

FKBP5 is also known as FK binding protein 5. This protein is a member the immunophilin protein family, which helps to regulate protein folding, immunoregulation and most importantly regulates glucocorticoid binding and sensitivity.

Binding of FKBP5 to the glucocorticoid receptor reduces cortisol-binding capacity leading to impaired negative feedback regulation of the HPA (Hypothalamic-Pituitary-Adrenal) axis leading to a prolonged stress response. It also produces an augmented stress reaction both emotionally and physically. This in turn heightens the HPA axis creating a cyclic stimulation of the central nervous system ultimately increasing the risk of anxiety, panic disorders, depression and other mood disorders.

Normal Allele: C **Variant Allele:** A

You are: AC

Key Characteristics of the Variant Allele:

- Increased FKBP5 expression
- Loss of negative feedback in the HPA axis
- Increased anxiety
- Prolonged short-term stress response- easier to get “stuck” in stress loop.
- Increased depression
- Increased PTSD, especially from childhood memories.

NR3C2
rs5522

NR3C2 or nuclear receptor subfamily 3 group C member is a mineralocorticoid receptor (MR) which plays a key role in the activation of the body’s stress pathway, the HPA or hypothalamic-pituitary-adrenal axis. It determines the sensitivity of the stress response.

Stress activates the HPA axis, resulting in the release of corticosteroids which bind to 2 receptors in the brain, the MR receptor encoded by this gene, and the glucocorticoid receptor (GR). Stress hormones, especially cortisol, have a very high affinity for these MR receptors, altering the sensitivity and activity of the HPA axis.

When cortisol binds into an MR, it induces a negative feedback loop within the HPA axis, inhibiting stimulation of the stress pathway. The greater the number of active MR receptors, the greater the negative feedback in the HPA axis, reducing the stimulation of the HPA axis. The variant C allele is associated with fewer MR receptors, and less negative feedback. This results in an increased physiological stress response, elevated depressive and anxious symptoms, increased HPA stimulation with less initiating stressors and loss of negative feedback with reduced cortisol-induced MR gene expression.

This variant C allele also increases the amount of ACTH produced by the hypothalamus, which stimulates the HPA axis to produce more cortisol.

The variant C allele is also associated with decreased focus, concentration, hyperactivity, impulsivity and increased ADD and ADHD.

Normal Allele: T **Variant Allele:** C

You are: TT

Key Characteristics of the Variant Allele:

- Fewer mineralocorticoid receptors
- Decreased negative feedback in the HPA axis
- Increased plasma ACTH
- Increased cortisol
- Increased depression
- Increased anxiety and hyperactivity
- Increased ADD/ADHD

Recommendation for Short Term Stress Response

You produce the normal amount of ACTH from the pituitary and cortisol from the adrenal glands for each stressor. You also have the normal number of hypothalamic receptors for mineralocorticoids to help shut off the HPA axis and return the nervous system to the quiet parasympathetic side.

In addition, your clearance of stress hormones through your COMT gene is fast, helping to decrease the length of time these stress hormones can bind and impact the nervous system.

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However, you produce a higher level of FKBP5, the binding protein that regulates glucocorticoid binding and sensitivity, impairing the negative feedback regulation of the HPA axis.

All of this slightly increases the risk of anxiety depression, PTSD, hyperactivity, panic attacks and exaggerated emotional responses.

Treatment is **Sereniten Plus by Douglas Labs** 1 capsules twice a day empty stomach (30 minutes or more before food, or 2 hours or more after) for 4-6 weeks and then reduce to 1 capsule a day empty stomach (30 minutes or more before food, or 2 hours or more after) increasing as needed for periodic stressors that occur.

Deep breathing and meditation.

Exercise according to your exercise genes.

Neurotransmitters

Long Term Stress Response

COMT
rs4680

COMT or Catechol-O-methyltransferase is an important enzyme produced by the COMT gene that degrades or metabolizes several catecholamines including dopamine, adrenaline and noradrenaline (epinephrine and norepinephrine), along with estrogens and certain drugs. This enzyme adds a methyl group that is donated by SAMe (S-adenosylmethionine) and is thus also a major methylation gene.

COMT is extremely active in the prefrontal cortex, the area in the brain that is responsible for cognitive behaviour, decision making, personality expression, learning, addictions and moderating much of social behaviour.

Increased COMT activity decreases the binding and activity along with increasing the clearance of dopamine, adrenaline, noradrenaline, and catechol estrogens by almost 50%.

With respect to the clearance of dopamine through this gene, the normal allele is considered the adverse position, for it has a faster clearance of dopamine.

Normal Allele: G Variant Allele: A

You are: GG

Key Characteristics of the Variant Allele:

- Decreased COMT activity.
- Increased dopamine leading to less addictive behaviour, less food cravings.
- Increased pleasure responses following a stimuli.
- Increased anxiety due to higher stress hormone levels
- Often called the Worrier (as opposed to the G allele referred to as the warrior).
- More obsessive-compulsive behaviours.
- Increased fear response associated with PTSD.

CRHR1
rs242939

Corticotropin releasing hormone receptor 1 or CRCH1 is the receptor that binds CRH, corticotropin releasing hormone, stimulating the HPA (hypothalamic-pituitary-adrenal) axis, pushing the nervous system to the sympathetic stress side.

The main function of CRH is to stimulate the pituitary to produce and release ACTH, which in turn stimulates the adrenals to produce cortisol, adrenaline and

□

noradrenaline. The C allele or variant allele has a higher number of CRH receptors to bind CRH continually stimulating the stress response and is thus associated with increased anxiety, depression, and mood disorders.

The subsequent increase in production of stress hormones from this SNP are also significantly linked to obesity, IBS and IBS-like symptoms, asthma and increased blood pressure.

Normal Allele: T **Variant Allele:** C

You are: TT

Key Characteristics of the Variant Allele:

- Increased CRH receptors
- Increased binding of CRH
- Increased stimulation of the HPA axis
- Increased anxiety
- Increased depression
- Increased obesity and unstable blood glucose levels.
- Increased bloating, gas and irregular bowel movements.

FKBP5

rs3800373

FKBP5 is also known as FK binding protein 5. This protein is a member the immunophilin protein family, which helps to regulate protein folding, immunoregulation and most importantly regulates glucocorticoid binding and sensitivity.

Binding of FKBP5 to the glucocorticoid receptor reduces cortisol-binding capacity leading to impaired negative feedback regulation of the HPA (Hypothalamic-Pituitary-Adrenal) axis leading to a prolonged stress response. It also produces an augmented stress reaction both emotionally and physically. This in turn heightens the HPA axis creating a cyclic stimulation of the central nervous system ultimately increasing the risk of anxiety, panic disorders, depression and other mood disorders.

Normal Allele: C **Variant Allele:** A

You are: AC

Key Characteristics of the Variant Allele:

- Increased FKBP5 expression
- Loss of negative feedback in the HPA axis
- Increased anxiety
- Prolonged short-term stress response- easier to get "stuck" in stress loop.
- Increased depression
- Increased PTSD, especially from childhood memories.

Recommendation for

Long Term Stress Response

You produce the normal amount of corticotropin releasing hormone (CRH) from your hypothalamus for each stressful event you encounter. This helps return your central nervous system back to the parasympathetic side, the quiet side, with greater ease following a stressful event. You also have the normal amount of CRH receptors with which to maintain parasympathetic stimulation.

In addition, your clearance of stress hormones through your COMT gene is fast, helping to decrease the length of time these stress hormones can impact the nervous system.

□

However, you produce a high level of FKBP5, the binding protein that regulates glucocorticoid binding and sensitivity, impairing the negative feedback regulation of the HPA axis and keeping your nervous system stuck for longer periods of time in the sympathetic stress side.

All of this allows the central nervous to get "stuck" in the sympathetic side with slightly greater ease, increasing risk of anxiety depression, PTSD, hyperactivity, panic attacks and exaggerated emotional responses.

Treatment is **Sereniten Plus by Douglas Labs** 1 capsules twice a day empty stomach (30 minutes or more before food, or 2 hours or more after) for 4 weeks after completing treatment for your short term stress response and then reduce to 1 capsule a day empty stomach (30 minutes or more before food, or 2 hours or more after), increasing as needed for periodic stressors that occur.

Deep breathing and meditation.

Exercise according to your exercise genes.

Exercise Cardiovascular

ACTN3
rs1815739

ACTN3 is a gene that codes for the production of the alpha actin 3 protein, one of the main proteins that form the fibers that are responsible for generating the explosive powerful contractions during sprints or HIIT (High Intensity Interval Training) style exercise. If the protein filaments which make up the muscle fiber contain a higher percentage of actin protein, then a stronger, more dense muscle fiber is formed, capable of performing more explosive contractions with decreased risk of injury.

C allele individuals have more actin 3 protein producing more fast twitch fibers, with thicker myelin sheaths around their nerves and faster nerve impulses from the brain to the muscle for quick powerful responses fuelled by short bursts of ATP. C/C allele individuals are the sprinters and are designed for true HIIT exercise.

T allele individuals have little to no actin 3 protein, and thus have few fast twitch fibers. Instead they have an abundance of slow twitch fibers for endurance sports and workouts. The T allele individual does not have the physical capability to sprint or perform HIIT style exercises. If they do they will increase the production of creatine kinases, a measurement of muscle breakdown and inflammation, along with cortisol, our body's stress hormone, for doing the wrong type of exercise for your body is a physical stressor.

Normal Allele: C Variant Allele: T

You are: CT

Key Characteristics of the Variant Allele:

- Unable to produce adequate Actin 3 protein
- Fewer fast-twitch fibers for sprinting or intervals
- Abundance of slow twitch fibers for endurance sports
- Better oxidative muscle metabolism over long periods of time
- Increased inflammation and DOMS (delayed onset muscle soreness) with HIIT.

ACE
rs4343

Ace is the gene that produces the enzyme angiotensin converting enzyme or "ACE" to transform angiotensin 1 into angiotensin 11. Angiotensin 11 is a vasoconstrictor that increases blood pressure, which in turn influences blood flow, sodium potassium pumps and the metabolism within the muscle.

□

Angiotensin 11 also acts upon nerves to increase the sensation of thirst and desire for salt to encourage the release of ADH (anti-diuretic hormone) from the pituitary and noradrenaline from sympathetic nerves. It also stimulates the adrenals to increase the production of aldosterone, increasing sodium retention and leaching potassium from the kidneys. The kidneys in response increase water reabsorption to increase blood volume and pressure. The end game of all of these responses is to increase the blood pressure and blood flow as well as the delivery of nutrients through the body.

A allele individuals produce far less ACE, decreasing the control of plasma sodium and potassium and thus the regulation of blood volume and pressure. As HIIT (High Intensity Interval Training) exercise is far more reliant on quick muscle reactions, it requires more blood flow in short bursts of which the A allele cannot produce. This is one reason why the A allele does not do well with HIIT exercise. They are far better with longer slower endurance, even more so at altitude. Similarly, if they attempt eccentric exercises (an exercise where the action of the muscle also lengthens it, for example the descend of a bicep curl) with increased weights the decreased blood flow across the muscle has been shown to increase creatinine kinase (CK) levels, a measurement of muscle inflammation and breakdown, far more than the G allele. Thus, the style of resistance of weight training they need is similar to their cardiovascular workout – endurance or multiple reps with lower or lighter weights.

Normal Allele: G Variant Allele: A

You are: GG

Key Characteristics of the Variant Allele:

- Produces less ACE for sprints or HIIT exercises.
- Better with endurance
- Better at altitude exercising compared to G allele
- Increased creatine kinase and inflammation.
- Inflammation worse with eccentric exercises, heavy weights, sprints or HIIT.
- Better is endurance resistance training – multiple reps, light weights, little to no breaks.

ADRB2 ex
rs1042713

The beta-2 adrenergic receptor is one of 7 members of the adrenergic receptor family. Similar to the other members, ADRB2 specifically binds and is activated by catecholamines.

This ADRB2 receptor is abundantly expressed in bronchial smooth muscle cells leading to bronchodilation, in the cardiac myocytes and vascular smooth muscle cells causing increased rate and force of heart contractions and vasoconstriction when stimulated.

The alpha adrenergic is the primary receptor for vasoconstriction, yet the beta receptor also has significant vascular effects. Unlike the alpha receptor, the beta receptor has far greater differences in the metabolic rate, metabolic responses and sudden cardiac events in response to exercise and stress.

The A allele is associated with far fewer ADRB receptors and thus less vasoconstriction and bronchodilation, particularly under stress or during intense exercise. Thus, the A allele is much better with longer slower endurance workouts. They have a lower resting cardiac output due to a reduced stroke volume (amount of blood pumped by the left ventricle of the heart in one contraction). This combined with a lower blood pressure and increased VO2Max (volume of oxygen per unit of time that an individual uses during exercise or exertion) makes them the ideal marathon runner.

Normal Allele: G Variant Allele: A

You are: GG

Key Characteristics of the Variant Allele:

- Fewer beta-2 adrenergic receptors
- Less vasoconstriction, lower blood pressure
- Higher peak oxygen consumption, increased VO2Max
- Better with endurance training or sports.
- Worse with sprints or HIIT (less bronchodilation with short intense exercise)

Recommendation for Cardiovascular

You have approximately equal distribution of fast and slow twitch fibers in your muscles. Fast twitch fibers enable one to sprint, and slow twitch fibers allow one to perform endurance exercises. As you have a mix between the two, you are best designed for a combination of moderated sprints and longer slower endurance.

You also have an increased blood flow in large quick bursts to the muscle during exercise and a better control of sodium-potassium regulation within the cells. In addition, you have more beta-2 adrenergic activity with increased bronchodilation with short intense exercise. Both of these effects further moderate your exercise style slightly towards faster sprints or HIIT (High Intensity Interval Training).

You are better with 1.5 to 2 minute intervals at 70-75% capacity, with 45 second recovery intervals at 40% capacity for 45-50 minutes twice a week. Alternating with a consistent cardiovascular workout for 45-60 minutes at about a 60% capacity twice a week.

Exercise Resistance Training

INSIG2 rs7566605

INSIG2 or insulin induced gene 2 produces a protein that when activated alters lipid synthesis and stimulates fatty acid synthesis. Its expression is downregulated by insulin and by exercise in certain individuals.

The INSIG2 gene is associated with obesity and increased BMI and how that is affected by resistance training. Each Allele responds metabolically differently to weight training, and that effect is slightly augmented between sexes.

Normal Allele: G **Variant Allele:** C

You are: CC

Key Characteristics of the Variant Allele:

- Higher baseline of subcutaneous fat especially in women.
- Women have less weight loss with high weight low repetition resistance training.
- Men can easily gain weight with high weight low repetition resistance training.
- Both sexes are better with high repetition resistance training.
- Better results making the resistance training like a cardiovascular workout.

ACE rs4343

Ace is the gene that produces the enzyme angiotensin converting enzyme or "ACE" to transform angiotensin 1 into angiotensin 11. Angiotensin 11 is a vasoconstrictor that increases blood pressure, which in turn influences blood flow, sodium potassium pumps and the metabolism within the muscle.

Angiotensin 11 also acts upon nerves to increase the sensation of thirst and desire for salt to encourage the release of ADH (anti-diuretic hormone) from the pituitary and noradrenaline from sympathetic nerves. It also stimulates the adrenals to increase the production of aldosterone, increasing sodium retention and leaching potassium from the kidneys. The kidneys in response increase water reabsorption to increase blood volume and pressure. The end game of all of these responses is to increase the blood pressure and blood flow as well as the delivery of nutrients through the body.

A allele individuals produces far less ACE, decreasing the control of plasma sodium and potassium and thus the regulation of blood volume and pressure. As HIIT

(High Intensity Interval Training) exercise is far more reliant on quick muscle reactions, it requires more blood flow in short bursts of which the A allele cannot produce. This is one reason why the A allele does not do well with HIIT exercise. They are far better with longer slower endurance, even more so at altitude. Similarly, if they attempt eccentric exercises (an exercise where the action of the muscle also lengthens it, for example the descend of a bicep curl) with increased weights the decreased blood flow across the muscle has been shown to increase creatinine kinase (CK) levels, a measurement of muscle inflammation and breakdown, far more than the G allele. Thus, the style of resistance of weight training they need is similar to their cardiovascular workout – endurance or multiple reps with lower or lighter weights.

Normal Allele: G **Variant Allele:** A

You are: GG

Key Characteristics of the Variant Allele:

- Produces less ACE for sprints or HIIT exercises.
- Better with endurance
- Better at altitude exercising compared to G allele
- Increased creatine kinase and inflammation.
- Inflammation worse with eccentric exercises, heavy weights, sprints or HIIT.
- Better is endurance resistance training – multiple reps, light weights, little to no breaks.

Recommendation for Resistance Training

You are designed for light weight, high repetition resistance training. You produce the normal amount of angiotensin converting enzyme or ACE, and thus have a good flush of blood volume over the muscle body during exercise, with adequate control of your sodium potassium pumps for repair from exercise.

The C variant allele coding for the INSIG2 gene is associated with an increased in subcutaneous weight fat deposition in both men and women, which is increased further when performing heavy weight, fewer repetition resistance training. This is even more prominent in men.

Treatment. Make your weight training more like a cardiovascular workout. Use light weights and multiple reps (15-20 reps) with little to no breaks in between exercises. Aim to do exercises that recruit more muscle groups at once. Eg, with light weights perform a shoulder press from a squat position, standing up at the same time as you perform your shoulder press to engage both the legs and the arms in one exercise. Repeat for 15 to 20 repetitions and then move straight into your next exercise. Aim for sets of each exercise 2 to 3 times a week.

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