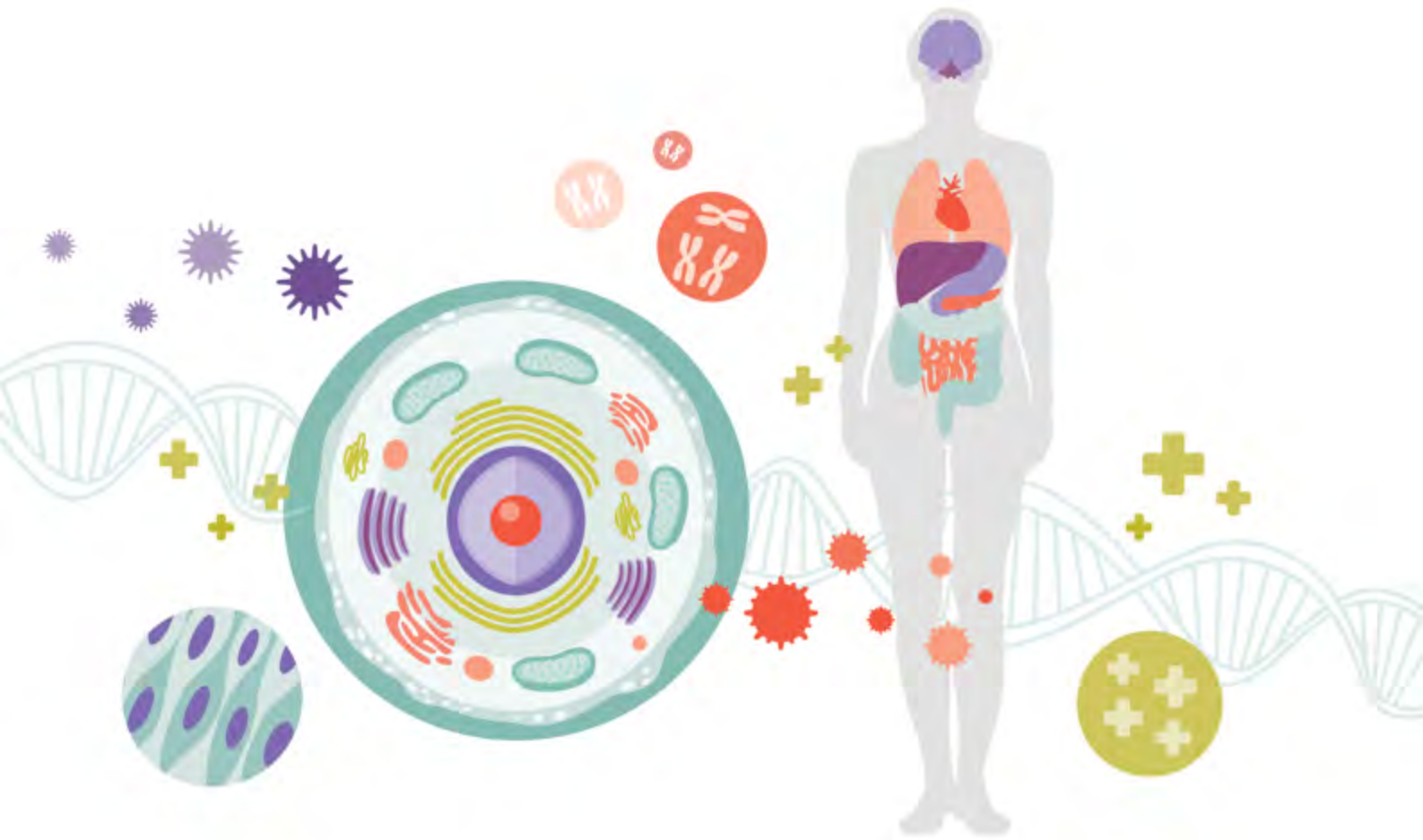




3X4 GENETICS



THE PERSONAL GENETIC STORY OF

HUGH RAYE



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Based on your unique genetic profile, 3 pathways are identified as potentially having the greatest impact on your health. For each of these pathways, 3 diet, 3 lifestyle and 3 supplements are recommended.

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Your individual gene results as well as a summary of your 36 pathways. Follow the purple and use the colors to identify the genes and pathways with the highest impact level.

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Your gene results and their color-coded impact that contributes to each of the 36 pathways.

# YOUR TOP 3 PATHWAYS

Hugh Raye

Gaining insight into how your unique genetic makeup impacts your health enables you to make the best possible daily choices. Based on your unique genetic results, the following three pathways have been identified as having the greatest potential to impact your health. Diet, lifestyle, and supplements are recommended for each pathway, to help you invest in a lifetime of health.

Make sure to consult a healthcare practitioner before embarking on any supplement regime.



## METHYLATION

VERY HIGH

Methylation is the biochemical process of making sure every cell is functioning optimally. Methylation is not just responsible for how we repair genetic material, but also how we make energy, respond to stress, handle inflammation, how well our cells detoxify, and how our brain chemistry works. Methylation is the process involved in actually turning genes on or off. We may be able to reduce our risk of developing certain diseases and some types of cancers by optimizing methylation.



1. Focus on foods high in B-complex vitamins, magnesium and choline by eating 3-4 servings of a combination of leafy and cruciferous vegetables (raw), avocados, citrus fruits, legumes, poultry, eggs, nuts, and seeds.
2. Eat quality proteins with essential building blocks for methylation and foods rich in vitamin B12, methionine and betaine like wild caught fish, organic poultry, grass-fed meats or wild game, garbanzo beans and edamame.
3. Support toxin breakdown with cruciferous vegetables, green and black teas. Support B vitamin absorption with fermented foods, adequate fiber, and limit alcohol.



1. Use daily relaxation techniques to reduce exposure to stress hormones which may burden the methylation cycle e.g. meditation, yoga, Qi Gong and massages.
2. Intentionally limit exposure to substances that overload the methylation cycle including medication, alcohol and endocrine disruptors.
3. Avoid external toxins like pesticides, plastic packaging, Teflon cooking utensils, cleaning products, cosmetics and synthetic clothing. Also eliminate toxins that cause DNA damage e.g. heavy metals like arsenic, cadmium, lead, pesticides, and contaminated drinking water.



1. B vitamins including 5-MTHF (200-400mcg), Methyl-B12 (100mcg), vitamin B2, B3, and B6 (P5P).
2. Zinc (20-30mg) and Magnesium (250-500mg).
3. Sulforaphane from whole broccoli sprout powder yielding 20mg (or as recommended by a healthcare practitioner), choline and methionine.



## OXIDATIVE STRESS

VERY HIGH

Oxidative stress is the human equivalent of rusting. The impact of all exposures over time results in damage to our cells. Unmanaged, oxidation can impact on our energy levels, memory, premature aging and sometimes cancer risk. In a healthy functioning cell, enzymes that counteract oxidative damage, a 'rust block' so to speak, are made. The ability to make those enzymes is determined by certain genes. However, a good diet and lifestyle can aid towards a lower oxidative burden and help maintain the health of your cells.



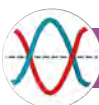
1. Consume 1-2 cups of whole plant foods e.g. dark leafy greens, chili peppers, olives, beetroot, pomegranate, berries and olive oil.
2. Eat foods rich in zinc, copper, selenium and manganese such as seeds, nuts, leafy greens and legumes.
3. Choose anti-inflammatory foods and spices rich in polyphenols and omega-3 such as cocoa, dark chocolate, berries, curcumin, black pepper, cardamom, cumin seeds and wild-caught fatty fish



1. Be aware that extensive endurance and high-intensity training increases the potential for oxidative stress. Manage training regime, and ensure recovery with rest and optimal nutrition.
2. Limit contact with strong pro-oxidants e.g. heavy metals, pesticides, mold, radiation, high dose iron and copper supplements. Long-term high dose oral vitamin C and E may interfere with the body's natural anti-oxidant response.
3. Regulate circadian rhythm by sleeping in a dark, cool environment for at least 7-8 hours per night. Limit exposure to electronic devices (blue light) before bed.



1. Coenzyme Q10 (Ubiquinol 300mg)
2. Alpha Lipoic Acid (500mg), Methylsulfonylmethane (MSM) (2-6g), Cantaloupe Melon extract rich in SOD e.g. GliSODin (6,6mg daily or as recommended)
3. Minerals such as zinc (30mg) and selenium (200mcg)



## GLUCOSE & INSULIN

VERY HIGH

Our cells run on glucose, a simple sugar obtained from the food we eat. Our bodies work hard to ensure the amount of glucose in the blood is kept at just the right level. High blood glucose is often associated with weight issues and diabetes, but chronically elevated blood sugar also has other effects such as accelerated aging and chronic inflammation, which underlie every major chronic illness. Insulin is manufactured in the body and is used to regulate glucose levels. The way insulin and glucose do their job is determined by certain genes as well as by other factors such as our weight, diet, and lifestyle choices.



1. Avoid added sugar and processed carbohydrates; focus on whole grains, quality protein and 4-5 servings of medium-chain triglycerides (MCTs) and unsaturated fats (olives, nuts, seeds, avocado and coconut).
2. Support glucose and insulin hormone health with foods rich in Selenium, Chromium, vitamin A, resveratrol and flavonoids (sweet and hot peppers, red grapes, broccoli, carrots, sweet potato, brazil nuts, poultry, beef and lamb).
3. Support the gut microbiome to produce short chain fatty acids like butyrate. Include 30-50g of fiber from barley, oats, onions, squash, turnips, and other root vegetables. Also add fermented foods (kimchi, sauerkraut and kombucha).



1. Be aware of medications that affect CoQ10, B12 and Folate, and Chromium levels.
2. Improve insulin sensitivity by grazing less, intermittent fasting (12-13 hours each night), endurance and strength training.
3. Improve glucose balance by reducing stress exposures and utilizing relaxation techniques such as rhythmic breathing and meditation daily.



1. Curcumin (300-600mg), Berberine (500-1500mg), Resveratrol (200-300mg)
2. Thiamine (50-100mg), Niacin (50-100mg), Biotin (5-15mg), Chromium (100-150mcg), Vanadium (5-10mg)
3. Gymnema (50-200mg), Cinnamon (100-200mg), Banaba leaf (400mg), Fenugreek (200-300mg)

# YOUR GENE RESULTS

Hugh Raye

Your unique gene results are color-coded, with purple having the highest impact on your body, and light green the lowest impact. Genes with the most significant impact are indicated with a star ★, genes with a protective impact are indicated with a shield 🛡️, and genes that have a negative impact in the training response pathway are indicated with a chevron ↘.

Gene	Variant	Result	Gene	Variant	Result
<b>PROTECTIVE</b>			<b>NO IMPACT</b>		
🛡️ BHMT	Arg239Glu G>A	GA	F2	20210 G>A	GG
🛡️ CAT	-262 C>T	CC	F5	Arg506Gln G>A	GG
🛡️ CYP1A2	-163 A>C	AA	FAAH	Pro129Thr C>A	CC
🛡️ TIMP4	-55 T>C	CT	FABP2	Ala54Thr G>A	GG
<b>SLOW RESPONSE</b>			FADS2	C>G	CC
↘ AMPD1	133 C>T	TT	FOXO1	A>G	AA
<b>NO IMPACT</b>			FOXO3	G>T	GT
ACE2	A>G	AA	FUT2	Trp153Ter G>A	GA
ACSL1	T>C	TC	GABRA2	Lys132Lys A>G	AA
ADRB3	Trp64Arg T>C	TT	GSTO2	Asn142Asp A>G	AA
ALDH2	Glu504Lys G>A	GG	GSTP1	Ile105Val A>G	AA
ANK3	A>G	AA	GSTP1	Ala114Val C>T	CC
ANK3	318473 C>T	CC	GSTT1	INS/DEL	INS
APOA2	-492 T>C	TT	HFE	C282Y/H63D	CC/HH
APOA5	-1131 T>C	TT	HIF1A	Pro582Ser C>T	CC
APOA5	C>A	CC	HLA	DQ 2.2/2.5/8	DQ2.2/DQ2.2
APOC3	3175 C>G	CC	HPA-1	T>C	TT
APOE	E2/E3/E4	E3/E3	HTR1A	-1019 C>G	CC
CACNA1C	G>A	GG	LEPR	Gln223Arg A>G	AA
CHRNA5	Asp398Asn G>A	GG	MC4R	T>C	TT
CHRNA5	C>T	CC	MMP1	-1607 1G/2G	1G/1G
CLOCK	3111 T>C	TT	MMP3	A>G	AG
COL1A1	1546 G>T	GG	NAT1	Arg187Gln G>A	GG
COL3A1	Ala698Thr G>A	GA	NOS3	-786 T>C	CC
CYP19A1	C>T	CC	NRF2	A>G	AA
CYP1A1	Ile462Val A>G	AA	OGG1	Ser326Cys C>G	CC
CYP1B1	Asn453Ser A>G	AA	OPRM1	Asn40Asp A>G	AA
CYP2C19	*1/*2/*17	*1/*1	PPARD	294 T>C	TC
CYP2C9	Ile359Leu A>C	AA	SHBG	Pro185Leu C>T	CC
CYP2D6	*1/*3/*10	*1/*1	SHBG	-68 G>A	GG
CYP3A4	-392 A>G	AA	SLC23A1	790 G>A	GG
DAO	C>T	CC	SLC2A2	Thr110Ile C>T	CC
DAO	His645Asp C>G	CC	SRD5A1	A>G	AA
DRD1	-94 G>A	GG	SULT1A1	Arg213His G>A	GG
DRD2	TaqIA C>T	CC	TNFA	-238 G>A	GG
EPHX1	Tyr113His T>C	TT	UCP1	-3826 A>G	AA
			UCP2	-866 G>A	GG
			UCP3	-55 C>T	CC
			UGT2B15	T>G	GG
			UGT2B17	INS/DEL	INS

# YOUR GENE RESULTS

Hugh Raye

## NO IMPACT

Gene	Variant	Result
VDR	Fok1 T>C	CC
VDR	Taq1 T>C	TC
VEGF	-634 G>C	GG

## LOW

ACVR1B	A>G	AG
ADIPOQ	-395 G>A	GA
ADRB2	Arg16Gly A>G	AG
ADRB2	Gln27Glu C>G	CG
AGT	Met235Thr A>G	AG
AKT1	G1172+23A T>C	TC
BDNF	Val66Met G>A	GA
CBS	699 C>T	CT
CETP	G>A	GA
CETP	Taq1B G>A	GA
CYP17A1	34 T>C	TC
CYP2C9	Arg144Cys C>T	CT
DIO2	Thr92Ala T>C	TC
FADS1	592 G>T	GT
GC	A>C	AC
GPX1	Pro198Leu C>T	CT
HNMT	939 A>G	AG
HO-1	-413 A>T	AT
IL-6R	Asp358Ala A>C	AC
IRS1	C>T	CT
LEPR	Lys656Asn G>C	GC
LPL	Ser474Ter C>G	CG
MTHFD1	1958 G>A	GA
MTRR	66 A>G	AG
NBPF3	T>C	TC
OXTR	A>G	AG
PEMT	-744 G>C	GC
PLIN	11482 G>A	GA
PON1	Gln192Arg A>G	AG
TAS2R38	Ala262Val C>T	CT
TNFA	-308 G>A	GA
VDR	Bsm1 G>A	GA

## MEDIUM

AGTR2	A>C	CC
COMT	Val158Met G>A	GA
HNMT	Thr105Ile C>T	CT
MMP2	Gly226Gly G>C	CC

## MEDIUM

MTHFR	677 C>T	CT
MTHFR	1298 A>C	AC
MTR	2756 A>G	GG
NQO1	Pro187Ser C>T	CT
SIRT1	994 T>C	TT
VEGFR2	His472Gln T>A	AA

## HIGH

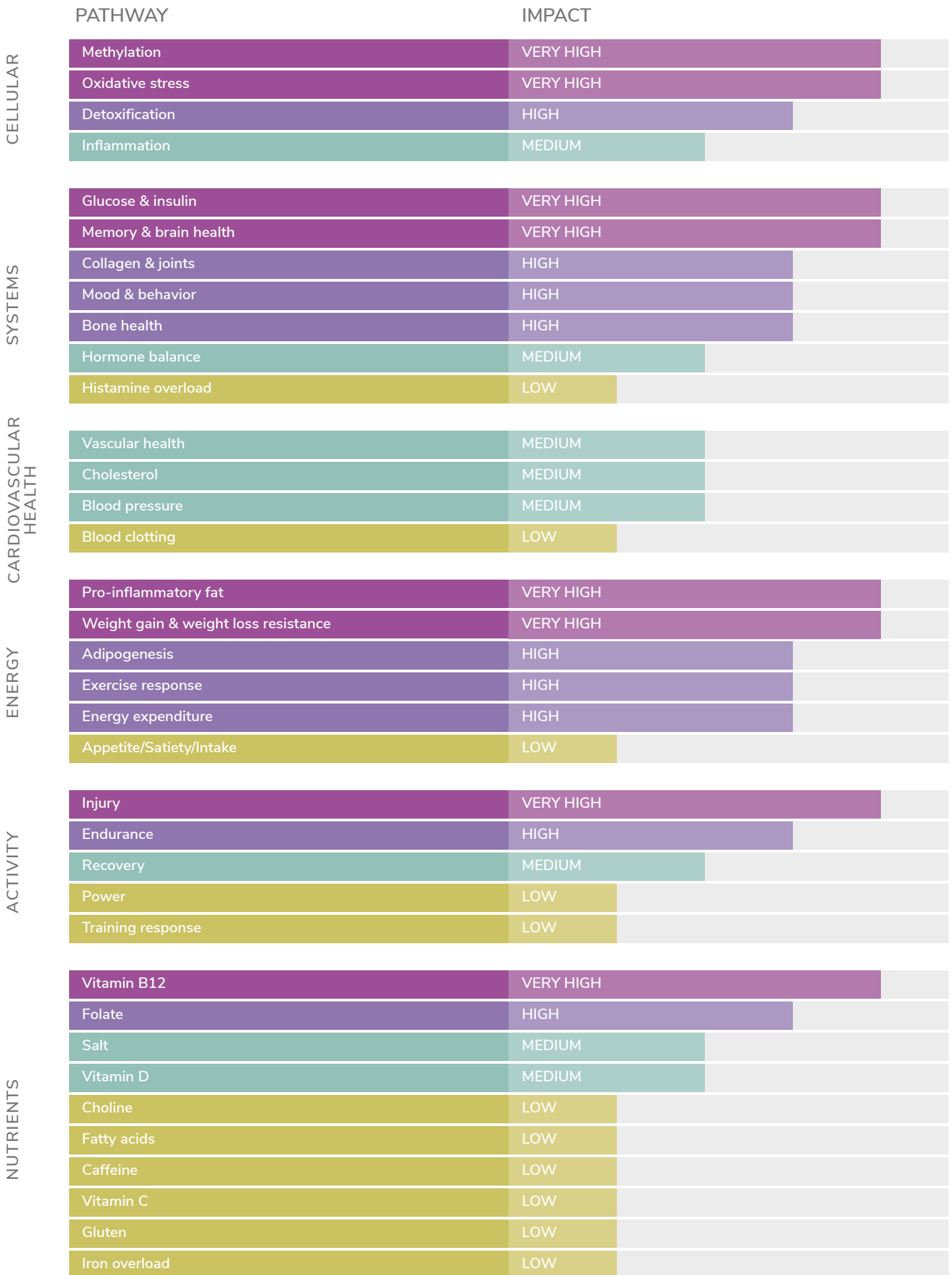
ACE2	7132 T>C	TT
ADIPOQ	-11391 G>A	GG
CKM	NcoI T>C	CC
COL12A1	AluI A>G	AA
CRP	2147 G>A	GG
DRD1	-48 G>A	GA
DRD3	Ser9Gly T>C	CT
DRD4	-521 C>T	TT
ENOS	Glu298Asp G>T	TT
FUT2	Gly258Ser G>A	GA
IL-6	-174 G>C	GG
LEPR	Lys109Arg A>G	AA
NAT2	R/I/S	Slow
PPARA	89204 G>C	GG
PPARG	Pro12Ala C>G	CC
VEGFA	-2578 C>A	AA

## VERY HIGH

★ ACE	Ins/Del	II
★ ACTN3	577 R/X	RR
CYP1B1	Leu432Val C>G	GG
CYP2R1	A>G	GG
FTO	87653 T>A	AA
GDF5	5'UTR C>T	TT
★ GSTM1	INS/DEL	DEL
IL-1	+/-	+
MAOA	Arg297Arg G>T	TT
MNSOD	Val16Ala T>C	TT
PPARGC1A	Gly482Ser G>A	GA
TCF7L2	IVS3 C>T	TT
★ TCN2	776 C>G	GG

# PATHWAY-BASED RESULTS

Hugh Raye

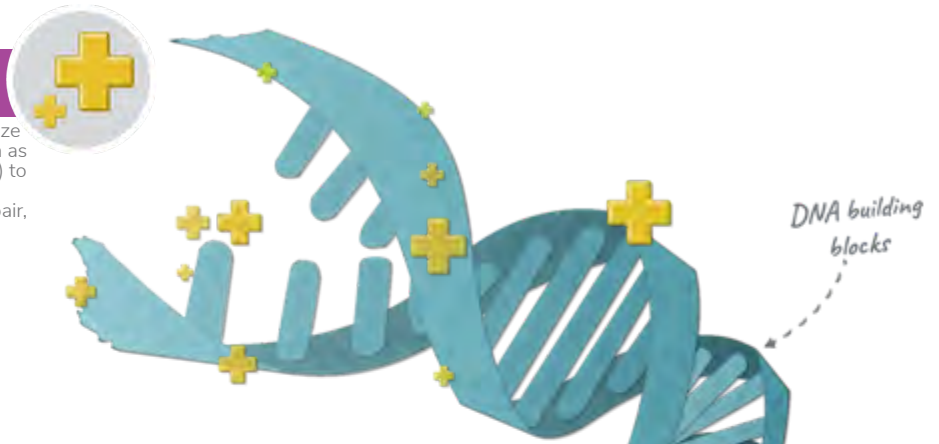


# CELLULAR OVERVIEW

We are the sum of our cells, and we are only as healthy as they are. Every cell in our body functions independently yet is connected to the whole. Like a small apartment inside a high-rise building, each unit takes care of its own day-to-day maintenance, but ultimately contributes to the overall functionality of the building.

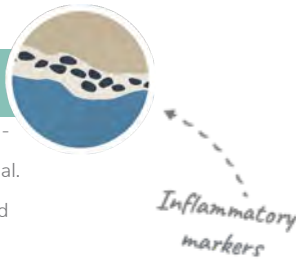
## 1 METHYLATION

**You are likely not methylating adequately.** Prioritize intake of B vitamins, choline, and folate (foods such as dark leafy greens, eggs, nuts, seeds & wholegrains) to support optimal methylation. Methylation is a biochemical process involved in the production, repair, and behavior of genes and metabolic processes.

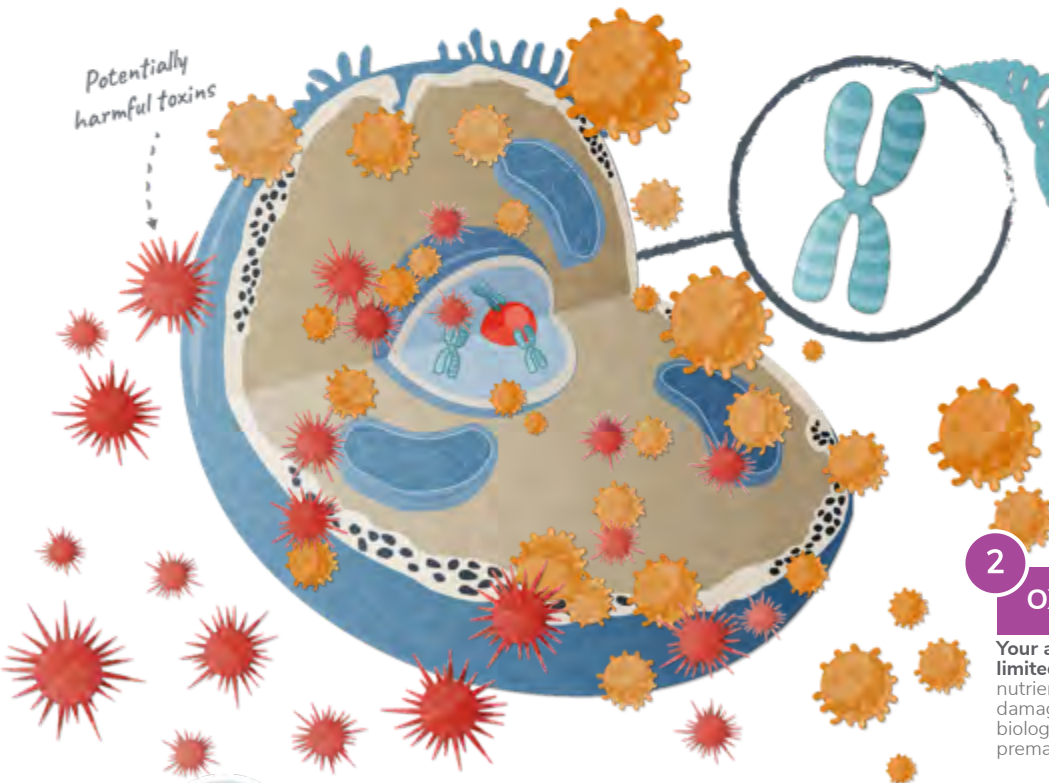


## 4 INFLAMMATION

**You may be prone to chronic inflammation.** An anti-inflammatory diet and lifestyle behaviors like intermittent fasting help reduce inflammatory potential. Inflammation is a natural immune response to bring about protection & repair. If left unchecked it may lead to chronic health conditions.



Potentially harmful toxins



Destructive oxidisers



## 2 OXIDATIVE STRESS

**Your ability to manage oxidative stress may be very limited.** Prioritizing plant foods rich in antioxidant nutrients, and avoiding pollutants, will help neutralize damage caused by harmful by-products from normal biological functions. Oxidative stress contributes to premature aging and several other diseases.

## 3 DETOXIFICATION

★ GSTM1 DEL

**You likely do not neutralize and remove toxins efficiently.** Be sure to include dark green leafy vegetables and those from the broccoli and onion families. Consider supplements, if necessary. Reduce environmental toxin exposures such as chemicals and pesticides, as without optimal detoxification, these pollutants can accumulate in the body and cause significant harm.



# SYSTEMS & CARDIOVASCULAR OVERVIEW

Inside your body are several highly sophisticated metabolic systems keeping you alive, healthy, and running smoothly. This network is like a complex underground railroad system, where multiple separate but interconnected parts are meticulously organized to keep everything on track, on schedule, and functioning optimally.

4

## MOOD & BEHAVIOR

**You are likely susceptible to mood imbalances.** Ensure adequate B vitamins, minerals, regular exercise, and stress management, to help create and maintain the balance of chemicals in the brain required to regulate mood.

2

## MEMORY & BRAIN HEALTH

**Without the right choices, there may be cognitive decline as you age.** Prioritize a healthy diet, regular exercise, activities involving hand-eye coordination, and brain games. These assist with maintaining flexibility in the brain, and the ability for learning, processing, remembering, and storing information.

7

## HISTAMINE OVERLOAD

**You are likely able to breakdown excess histamine.** Histamine is produced during an immune response to triggers such as allergens, injury, or toxins, leading to overload if not broken down effectively.

6

## HORMONE BALANCE

**Your hormone balance may be impaired.** Focus on sleep and stress management, regulate blood sugar, avoid all toxins, and eat vegetables from the broccoli family daily to support your body's ability to balance hormones.

1

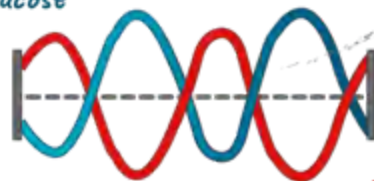
## GLUCOSE & INSULIN

**You are likely prone to blood sugar dysregulation.** Eat unrefined high-fiber foods and prioritize the intake of quality proteins, plant fats, and vegetables to support blood sugar regulation. Glucose and insulin production needs to be in balance to prevent damage to cells, systems, and organs.

No BPA  
in your H2O

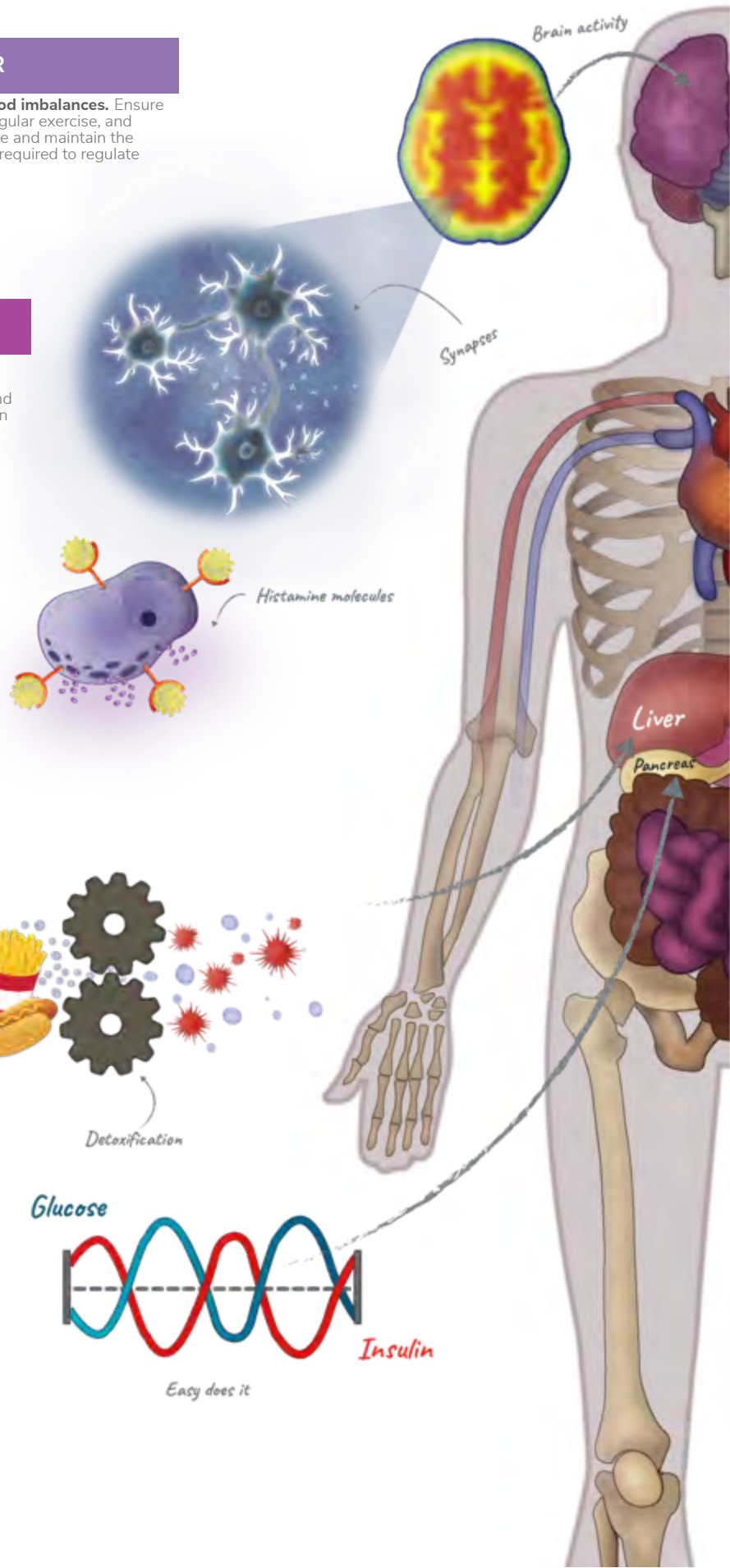


Glucose



Insulin

Easy does it



4

## CARDIOVASCULAR HEALTH

### BLOOD CLOTTING

**You likely are not prone to blood clotting.** Blood clotting is a survival tactic to prevent uncontrolled bleeding but can cause harm when the formation and breakdown of clots is inappropriate.

2

## CARDIOVASCULAR HEALTH

### CHOLESTEROL

**You may be prone to high cholesterol.** A healthy lifestyle, plant-based fats, generous amounts of vegetables, and a high-fiber diet, help manage cholesterol. Cholesterol metabolism is influenced by how various fats are processed and stored within the blood vessels.

1

## CARDIOVASCULAR HEALTH

### VASCULAR HEALTH

**There is a moderate likelihood of blood vessel damage.** Include foods rich in polyphenols, and focus on stress management and regular exercise to support blood vessel health. The integrity of arteries and veins affects blood flow and the development of chronic conditions.

3

## CARDIOVASCULAR HEALTH

### BLOOD PRESSURE

**You may experience blood pressure dysregulation.** Diet, lifestyle, and stress factors influence blood pressure and may need attention. Blood pressure is associated with damage to the artery wall and fluid retention in the blood vessel.

5

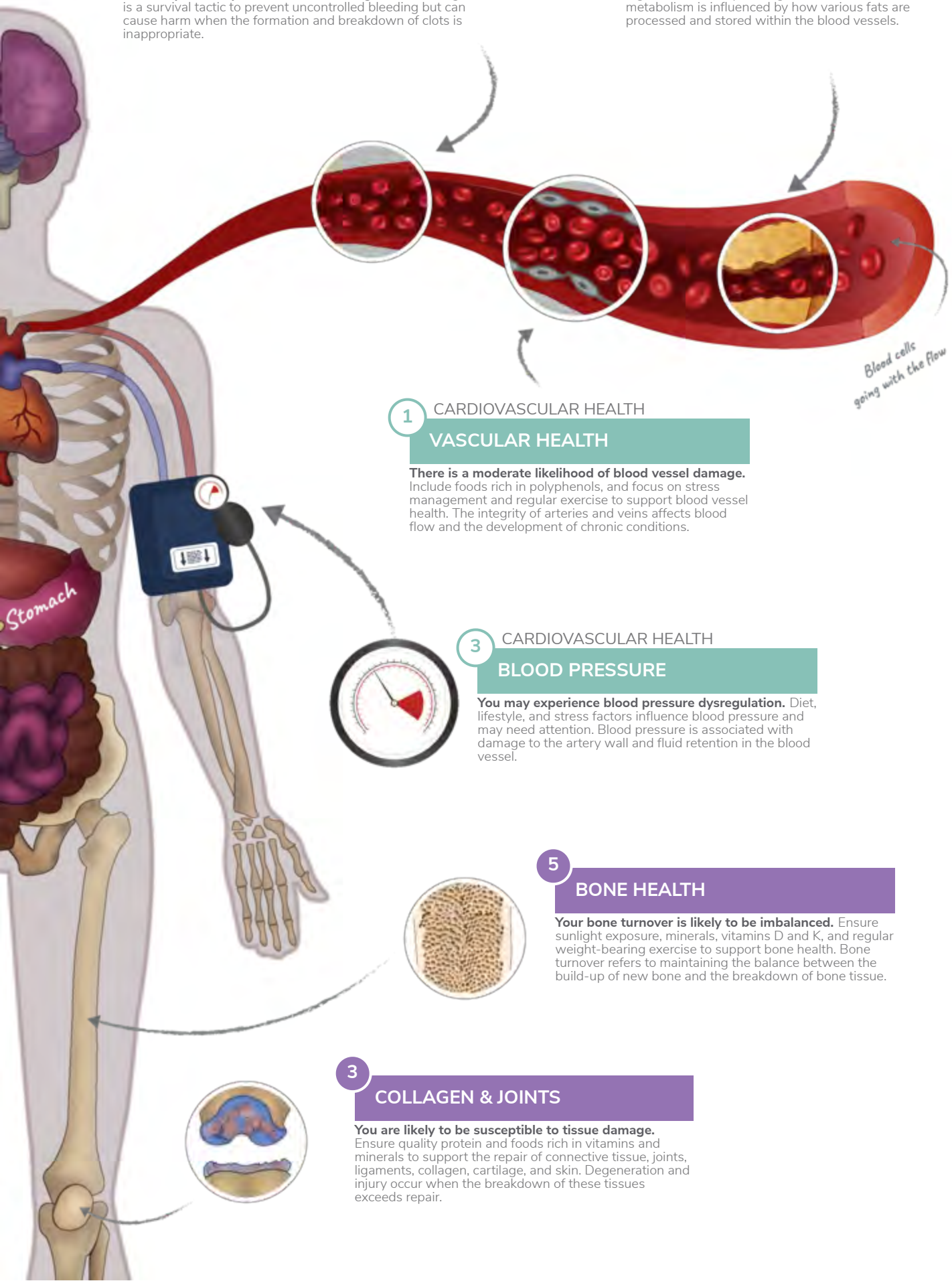
## BONE HEALTH

**Your bone turnover is likely to be imbalanced.** Ensure sunlight exposure, minerals, vitamins D and K, and regular weight-bearing exercise to support bone health. Bone turnover refers to maintaining the balance between the build-up of new bone and the breakdown of bone tissue.

3

## COLLAGEN & JOINTS

**You are likely to be susceptible to tissue damage.** Ensure quality protein and foods rich in vitamins and minerals to support the repair of connective tissue, joints, ligaments, collagen, cartilage, and skin. Degeneration and injury occur when the breakdown of these tissues exceeds repair.



# ENERGY OVERVIEW

How we consume, absorb, distribute, store, and burn the calories we gain from food varies between individuals, largely because of genetic variation. People respond very differently to calories, exercise, fasting, fatigue, etc. Hunger and feeling full is also experienced very differently. Knowing in what way you're hard-wired to manage food can be a powerful way to enable you to work with your body, not against it.

6

## APPETITE/SATIETY/INTAKE

**You likely don't have an unregulated appetite.** Adequate quality protein and regular fiber, as well as mindful eating, contributes to better food choices.



*What does it take to get you feeling full?*

1

## PRO-INFLAMMATORY FAT

**Your fat cells are prone to inflammation.** Prioritize anti-inflammatory foods and avoid toxins, food additives, and stress, to help prevent fat cells from becoming inflamed. Inflammation inhibits the efficient release of energy from fat stores.

*Fat Cells*

*Some people have more and bigger fat cells*

*Energy out*



*Inflammatory markers stick to excess fat*

3

## ADIPOGENESIS

**Your potential to readily store fat is elevated.** Support detoxification and inflammation, prioritize regular exercise and consider intermittent fasting to help release energy from fat stores. Adipogenesis refers to the ability of the body to make new fat cells and store them.

*Calories in*

5

## ENERGY EXPENDITURE

**Your resting metabolism may be slower than is optimal.** Prioritize fat-burning foods such as eggs, green tea, and spices like chili peppers. Also, include regular exercise and strength training to increase metabolism. Resting metabolism refers to the energy needed to carry out important bodily functions.

*How many calories do you burn each day*

4

## EXERCISE RESPONSE

**Your fat cells release fuel less efficiently when you exercise.** Regular exercise will always play a role in weight management and contributes greatly to general health and well-being. However, prioritizing a quality diet, good sleep, and stress management will be required to enable weight loss.

*How effective is exercise?*

2

## WEIGHT GAIN & WEIGHT LOSS RESISTANCE

**You are likely to gain weight easily and may lose weight slowly.** Consider working with a healthcare practitioner who can provide you with a personalized weight management program, including realistic goals, behavioral change, and regular support.



# ACTIVITY OVERVIEW

Your genes go a long way in determining how your body responds to exercise. Understanding the best training strategy for your body helps you train effectively while avoiding injury. Your potential for endurance and power-based sports performance provides insights into how you can optimize your training program. Knowing how your body recovers from training will help you achieve your fitness goals in a sustainable way.

5

## TRAINING RESPONSE ★ ACE II

You may have a low to normal response to training. Prioritize increasing your VO2 max to improve your fitness. A qualified exercise specialist will be helpful in developing and supporting a progressive and personalized training program.



### TRAINING FOR THE RACE

Invest in strength, balance and range of motion exercises to prevent injuries



1

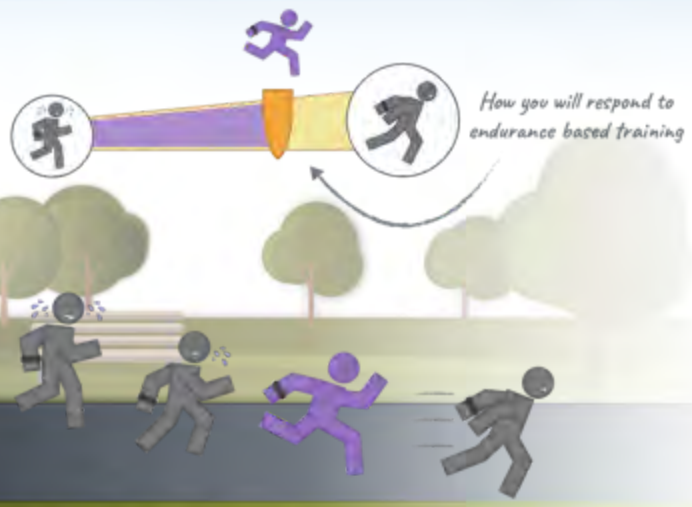
## INJURY

You are very likely prone to soft tissue injuries. Help prevent ligament and tendon injuries by prioritizing exercises that increase range of motion, improve balance, and promote strength. Consult with an exercise specialist to assist.

2

## ENDURANCE

You have above average endurance potential and will likely respond well to endurance training. See significant gains by ensuring your low-intensity sessions are endurance- and goal-specific. Increase the frequency and duration of your training sessions incrementally and stay consistent.



4

## POWER ★ ACTN3 RR

You may take longer to respond to power training. Build your power capacity by including regular high-intensity, explosive workouts. Perform full-body functional movements, and follow a consistent and progressive training plan to maximize your gains.



### AFTER THE RACE

3

## RECOVERY

You likely need some support to recover from exercise. Plan for active recovery sessions or rest days. Support recovery by including quality nutrition, protein-rich meals, and uninterrupted sleep after exercise.



Low intensity activities helps with recovery

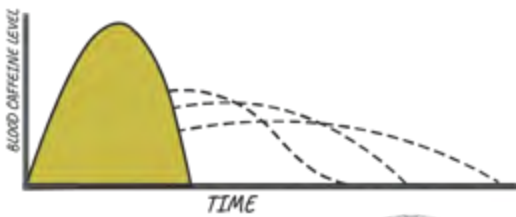
# NUTRIENTS OVERVIEW

Vitamins, minerals, and compounds found in food are integral to keeping our body's processes working optimally. They keep our cells robust and efficient, and they support our genes switching on and off as needed. Insights from our genes help us make the best dietary choices by understanding how we respond to certain foods and nutrients.

7

## CAFFEINE

**You are a fast metabolizer of caffeine.** You likely feel the effect of caffeine soon after consumption, including its ergogenic benefits.



10

## IRON OVERLOAD

**You have a very low chance of developing hemochromatosis.** If your blood iron profile is ever abnormal, investigate further as hemochromatosis is not the only reason for elevated iron. Iron accumulation in the body can precipitate a number of disease conditions, and should be ruled out.

6

## FATTY ACIDS

**You likely metabolize fatty acids optimally.** Optimizing fatty acid balance by including healthy fats and avoiding unhealthy fats is still essential. Fatty acids play many important roles in the body, including in cell membrane structure and function.

5

## CHOLINE

**You likely have no increased requirement for dietary choline.** Including dietary choline from foods such as eggs and peanuts is still essential. Choline regulates memory, mood, energy production and DNA health. Choline also plays a valuable role in pregnancy and menopause.

2

## FOLATE

**Your ability to optimally utilize dietary folate is likely reduced.** Ensure dark green leafy vegetables and beans daily to support your folate levels and consider supplements (if necessary). Folate builds tissues, maintains brain chemicals and blood cells, and ensures DNA health.



9

## GLUTEN

You have a rare chance of developing celiac disease, a gut condition associated with exposure to gluten. If experiencing any gut symptoms, consult a practitioner who may investigate for non-celiac gluten and other food sensitivities.



4

## VITAMIN D

You may have a higher requirement for vitamin D. Include sunlight exposure, vitamin D-rich foods, and consider a vitamin D3 supplement (if required) to help support your Vitamin D levels. Vitamin D is a vital nutrient, involved in multiple biochemical pathways essential for heart, bone and brain health.

3

## SALT

★ ACE II

You may be mildly sensitive to salt. There is a chance your salt intake will influence your blood pressure. Be aware of the salt content of processed and pre-prepared foods, and where possible, use herbs and spices to flavor your food.

8

## VITAMIN C

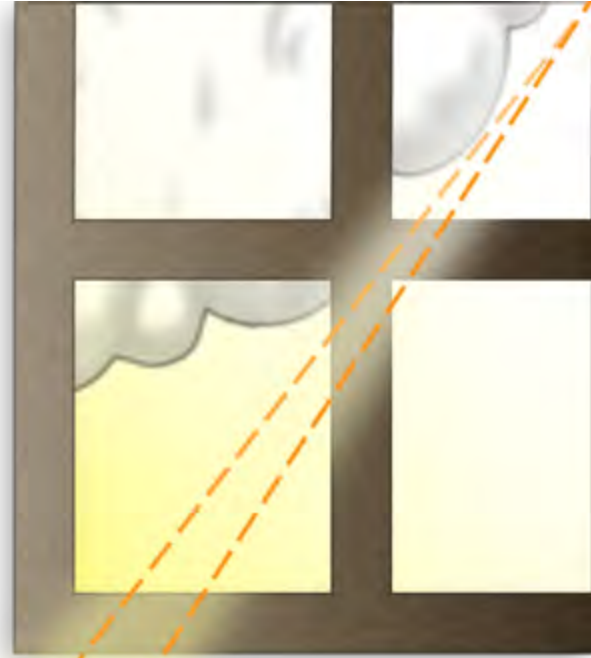
You likely do not have an increased demand for vitamin C. Including vitamin C rich foods is still essential for the maintenance of connective tissue, immune health and the removal of toxins.

1

## VITAMIN B12

★ TCN2 GG

Your ability to absorb and transport vitamin B12 may be highly reduced. Prioritize animal proteins, focus on gut health, and consider vitamin B12 supplements (if required), to support vitamin B12 levels. B12 impacts the health of all cells and the making of DNA.



# PRACTITIONER-DRIVEN PERSONALIZATION

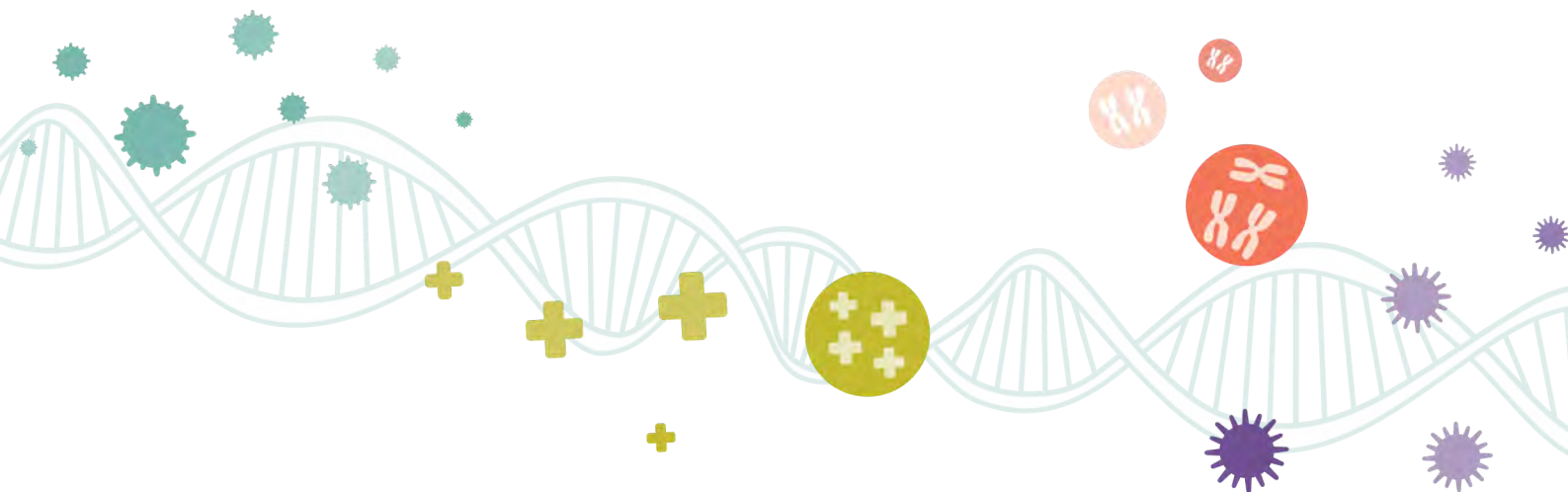
## Taking a Deeper Dive into your Genes

Whether you want to live your most optimal life, manage your weight better, prevent or manage a chronic condition, or improve your athletic performance, your 3X4 Blueprint will help get you there.

Your genetic results provide an important piece of the puzzle, but a deeper and fuller picture begins to emerge when your genetic insights are combined with your medical history, unique diet, lifestyle, and exercise preferences, all in the hands of an expert genetic practitioner.

If you are looking for a detailed action plan, and deeper insights into your gene results, 3X4 has an extensive network of practitioners who are ready to guide you.

Get in touch with us to find a practitioner who can help you reach your goals.



# THE GLOSSARY



## ADIPOGENESIS | HIGH

ENERGY

The formation, storage, and release of fat cells are affected by variability in our genes. These gene variations may be partly responsible for why some people find it easy to gain or lose weight compared to others, even though their diet and lifestyles are similar. How our fat cells release energy is determined by certain genes and their variations. Knowing how your fat cells are predisposed to store and release energy can empower you to make the right diet and lifestyle choices to suit your unique genotype.



## APPETITE/SATIETY/INTAKE | LOW

ENERGY

Some people are very sensitive to the sensation of satiety (fullness), while others often overeat and take longer to register that they are full. We all experience hunger and fullness differently. While many people believe that serving sizes and other eating behaviors should be equal for all, variations in our genes determine our appetite level and satiety to some degree, and consequently, may affect our eating patterns (snacking, binge eating, servings, frequency of meals, etc.) in a very real, biological way.



## BLOOD CLOTTING | LOW

CARDIOVASCULAR HEALTH

Blood clotting is a survival mechanism designed to prevent uncontrolled bleeding. On the other hand, excess blood clotting, which may be linked to genetic variants coupled with diet and lifestyle factors also needs to be addressed. When clotting occurs, the clot travels to a small blood vessel or vein in either the heart, brain or extremities and may result in a stroke, heart attack or deep vein thrombosis. There are numerous preventative actions that can be taken.



## BLOOD PRESSURE | MEDIUM

CARDIOVASCULAR HEALTH

Blood pressure indicates how hard the heart is working in order to pump blood around the circulatory system, and is used as a measure for confirming good health. High blood pressure can cause damage to blood vessels, delicate tissues in organs and systems in the body. Genetic variance impacts the ability to contract and relax blood vessels and balance fluid volume within them.



## BONE HEALTH | HIGH

SYSTEMS

Bones offer important structural support and protective roles within our body. Bone is made up of minerals such as calcium and phosphorus, which is also used elsewhere in the body. The turnover of these minerals in the breakdown or build-up of new bone cells is important for bone health. Gene variants may impact these processes and affect the balance of breakdown and build-up. Diet and lifestyle choices also contribute a great deal to these processes.

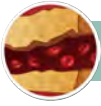


## CAFFEINE | LOW

NUTRIENTS

Caffeine is a central nervous system stimulant. In small amounts, caffeine's effects include mild euphoria, alertness, and enhanced cognitive performance, but in higher quantities, it can trigger anxiety, restlessness, irritability, nausea, and insomnia. The break down (metabolism) of caffeine in the body can vary to up to 40-fold between individuals, and is largely a genetically-determined ability. Certain gene variants confer a higher sensitivity to caffeine and are associated with slower metabolism of caffeine.

# THE GLOSSARY



## CHOLESTEROL | MEDIUM

## CARDIOVASCULAR HEALTH

Cholesterol metabolism refers to processes that determine the distribution of lipids in the body. Fats bind to proteins that transport them in the bloodstream between organs. Different forms of fat particles have important roles to play as part of cell membrane structures and as precursors for hormones. Suboptimal cholesterol processes may result in an imbalance in the accumulation and breakdown of fats in the bloodstream, which most commonly leads to cardiovascular diseases like heart disease and stroke.



## CHOLINE | LOW

## NUTRIENTS

Choline is a vitamin that plays an important role in the building of cell membranes. It is a key nutrient for a healthy pregnancy, mood regulation, memory and making new DNA. It is also involved in fat transport and supports methylation. Certain genes may affect the availability of choline, increasing dietary choline requirements.



## COLLAGEN & JOINTS | HIGH

## SYSTEMS

All our cells are continuously being renewed by being broken down and replaced by new ones. Collagen is the major structural protein and the foundation of all our soft-tissue (skin, hair, nails, joints, and organs). Variations in collagen genes might affect the structure and function of these areas. Causing excessive breakdown of cells without a comparable formation of new cells will result in degeneration. Genes play a large part in the process of collagen formation and breakdown, as does lifestyle factors such as diet and exercise.



## DETOXIFICATION | HIGH

## CELLULAR

Detoxification is the body's way of getting rid of toxins that could otherwise build up and interfere with health. Signs of poor detox include lethargy, fatigue, difficulty concentrating and unexplained aches and pains in the body. The liver is the main site of whole-body detox but every cell has its own toxin-eliminating processes to keep it clean, healthy and working well. Detoxification can be optimized by making the right diet and lifestyle changes to support good cellular cleaning processes.



## ENDURANCE | HIGH

## ACTIVITY

Endurance refers to activities where muscles are exercised at lower intensities for prolonged periods of time. Your genes play a role in determining how well you will respond to endurance-based activities, and can be used as a guide to optimize your exercise program to get the best results. Endurance levels will improve when you follow a program that gradually increases your training load (duration, frequency and intensity). Numerous health benefits can be achieved at lower intensities of exercise.



## ENERGY EXPENDITURE | HIGH

## ENERGY

Energy expenditure is the amount of energy (kilojoules or calories) that is needed to carry out important functions such as breathing, digesting food, circulating blood, regulating temperature, and exercising. The more commonly used term when referring to how we burn calories is to say we have a 'fast' or 'slow' metabolism. The rate at which we use and manage calories for energy is largely determined by our genes, our activity, what and how much we eat, resulting in significant individual differences between how we burn energy.

# THE GLOSSARY



## EXERCISE RESPONSE | HIGH

ENERGY

Research has confirmed that people's response to exercise varies considerably. Some respond quickly to exercise (e.g. they get fit fast and their body composition changes favorably), while others are less sensitive to exercise's effects. A significant contributor to these differences in exercise response is genetics. An individual's ability to mobilize stored body fat and burn it for exercise fuel is partly predisposed by certain genes. It is useful to understand the extent exercise may help weight loss and how to balance these factors out.



## FATTY ACIDS | LOW

NUTRIENTS

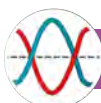
Fatty acids are the building blocks of fats and perform many important functions in the body. They are the base for cell membranes, help make hormones, are involved in inflammation, brain function and the immune system. Different dietary fats impact the body in different ways and our genes impact how these fats are metabolized and processed. Good quality dietary fat intake may correct these imbalances driven by genes.



## FOLATE | HIGH

NUTRIENTS

Folate is an essential vitamin that works together with all B vitamins and plays a vital role in methylation. Folate also helps maintain brain, nerve, blood cells, and DNA health. Natural occurring folate is found in numerous foods including leafy greens, legumes and asparagus. The synthetic form is called folic acid, commonly used in supplements and fortified foods, but is less beneficial compared to folate. Genetic variation affects the availability and the requirement for folate.



## GLUCOSE & INSULIN | VERY HIGH

SYSTEMS

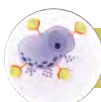
Our cells run on glucose, a simple sugar obtained from the food we eat. Our bodies work hard to ensure the amount of glucose in the blood is kept at just the right level. High blood glucose is often associated with weight issues and diabetes, but chronically elevated blood sugar also has other effects such as accelerated aging and chronic inflammation, which underlie every major chronic illness. Insulin is manufactured in the body and is used to regulate glucose levels. The way insulin and glucose do their job is determined by certain genes as well as by other factors such as our weight, diet, and lifestyle choices.



## GLUTEN | LOW

NUTRIENTS

Celiac disease occurs when there is an immune reaction to gluten which is the protein found in wheat, barley, triticale and rye. In these cases, gluten can cause inflammation in the gut which may damage the gut wall and potentially lead to complications resulting in deficiency conditions like anemia, osteoporosis and thyroid problems. If certain genes variants are present, gluten may need to be removed from the diet completely.

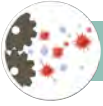


## HISTAMINE OVERLOAD | LOW

SYSTEMS

Histamine is a chemical produced by mast cells, that is involved in immunity and the removal of allergens from the body. It also helps with digestion and is released in response to injury and toxins. Histamine can be made by bacteria in the gut but is also present in certain foods. Genes regulate enzymes that are responsible for histamine breakdown. Inefficient breakdown may result in a histamine overload and cause symptoms like migraines, flushing, dizziness, skin rashes and hives.

# THE GLOSSARY



## HORMONE BALANCE | MEDIUM

SYSTEMS

Hormones are chemical messengers produced by our glands. They instruct organs and systems in the body on how to function. The main female hormones include estrogen and progesterone. These are necessary throughout the life cycle for the regulation of most major female-related bodily processes including puberty, fertility, pregnancy, and menopause. Androgens are also present in women but to a lesser degree. The main male hormones are known as androgens which include the powerful male hormone testosterone. Androgens are necessary throughout the life cycle for the regulation of most major male-related bodily processes including puberty, fertility, and andropause. Estrogen is also present in men but to a lesser degree. Ineffective hormone metabolism can contribute to certain conditions. Genes, as well as diet and lifestyle factors, regulate the activation and breakdown of these hormones.



## INFLAMMATION | MEDIUM

CELLULAR

Inflammation is a normal automatic immune response to injury, irritation or infection. When you bump your toe and it becomes swollen, that's the inflammatory response working to speed up healing. Sometimes injuries or irritations are internal (in places like our gut, muscles, joints, or blood vessels). Inflammation is protective by design, but can become destructive if left unchecked. Long term, chronic inflammation can eventually lead to conditions like arthritis, eczema, IBS, autoimmune conditions, and several diseases.



## INJURY | VERY HIGH

ACTIVITY

Injuries are caused by many internal and external factors. A torn tissue or chronic overuse of muscles, tendons or ligaments does not affect everyone in the same way, or necessarily result in injury. The combination of your body's make-up and genetics contribute to the development of injuries. Knowing your genetically determined risk for injury can help to manage and avoid these risks, and help you adjust exercise, lifestyle, diet, and recovery routines accordingly.



## IRON OVERLOAD | LOW

NUTRIENTS

Certain genes affect the body's ability to transport iron from the tissues to the blood, so that excess iron can be excreted. Excessive iron accumulation within the tissues, known as hemochromatosis, is a condition that can result in the damage of organs which can precipitate disease conditions such as diabetes, cancer, irregular heart beat and liver cirrhosis.



## MEMORY & BRAIN HEALTH | VERY HIGH

SYSTEMS

The brain is the control center of the body, and keeping it healthy is crucial for overall mental and physical health. Apart from regulating all of your hormones and other biological processes, the brain is also responsible for cognitive function, including attention, focus, learning capacity, and memory. Brain health and function tend to decline with age but at a faster rate in individuals with unfavorable diet and lifestyle behaviors. Certain genetic variations may be another reason why our brain health and cognitive function might not be optimal.

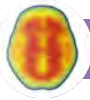


## METHYLATION | VERY HIGH

CELLULAR

Methylation is the biochemical process of making sure every cell is functioning optimally. Methylation is not just responsible for how we repair genetic material, but also how we make energy, respond to stress, handle inflammation, how well our cells detoxify, and how our brain chemistry works. Methylation is the process involved in actually turning genes on or off. We may be able to reduce our risk of developing certain diseases and some types of cancers by optimizing methylation.

# THE GLOSSARY



## MOOD & BEHAVIOR | HIGH

SYSTEMS

It is normal for our mood to change depending on the situation, but when our emotional state leads to changes in behavior that affect our ability to deal with daily routines, support should be sought. Genetics affects our ability to manufacture and balance chemicals in the brain that are necessary to manage mood, anxiety, depression, addiction and related behaviors. In addition, diet and lifestyle choices impact brain chemicals and may require adjustment.



## OXIDATIVE STRESS | VERY HIGH

CELLULAR

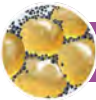
Oxidative stress is the human equivalent of rusting. The impact of all exposures over time results in damage to our cells. Unmanaged, oxidation can impact on our energy levels, memory, premature aging and sometimes cancer risk. In a healthy functioning cell, enzymes that counteract oxidative damage, a 'rust block' so to speak, are made. The ability to make those enzymes is determined by certain genes. However, a good diet and lifestyle can aid towards a lower oxidative burden and help maintain the health of your cells.



## POWER | LOW

ACTIVITY

Power refers to activities where muscles are exercised at higher intensities for shorter periods of time. It is the product of force and the speed at which the action is performed. Power is important for athletic performance, and genetics play a significant role in how a person's power capacity can improve following a strength and power-based training program. Many daily activities are enhanced by adequate power capacity. It becomes even more important to continue with strength and power-based exercises as you age and muscle mass decreases.



## PRO-INFLAMMATORY FAT | VERY HIGH

ENERGY

Fat cells are not just inactive storage compartments for excess weight - they are metabolically active messengers that control our energy levels. These messenger molecules found in fat tissue are called adipokines. Fat tissue secretes various pro- and anti-inflammatory adipokines to manage inflammation. If there is excess adipose tissue in the body, the inflammatory response can become disrupted, and these proinflammatory molecules increase. Obesity-induced inflammation can be managed by losing excess weight, which reduces adipokines.



## RECOVERY | MEDIUM

ACTIVITY

Because exercise is a type of 'stress' on the body (the good kind of stress), some level of wear and tear inevitably occurs in muscles and tissues during and directly after a workout (this is how muscles grow). Given the right recovery resources and building blocks, the body quickly repairs and rebuilds muscles and tissues back to a healthy, normal state, ready for the next exertion. Without enough recovery time or resources, inflammation and oxidative stress can arise in the body and the risk for tissue break-down, injury, and pain increases.



## SALT | MEDIUM

NUTRIENTS

Salt sensitivity is estimated to be present in 51% of individuals with high blood pressure and 26% with normal blood pressure. In individuals with salt sensitivity, blood pressure may increase when excess sodium is consumed. Although the mechanisms underlying salt sensitivity are complex, your genes can help determine and predict your response to salt.

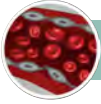
# THE GLOSSARY



## TRAINING RESPONSE | LOW

ACTIVITY

Your genetics plays a significant role in influencing your baseline fitness level, as well as your response to aerobic training. Your fitness levels and training response can be measured as VO2 max, which is the maximum amount of oxygen you can use during intense exercise. The higher your VO2 max, the fitter you are. Being fitter reduces your risk of cardiovascular disease and improves quality of life. High VO2 max levels are associated with performance in endurance-based sports.



## VASCULAR HEALTH | MEDIUM

CARDIOVASCULAR HEALTH

Veins and arteries make up a network in the body responsible for transporting oxygen and nutrients to our organs and systems, and for removing waste. Having healthy blood vessels means maintaining their strength and flexibility. Loss of function makes them vulnerable to damage and disease. Certain genes, and diet and lifestyle factors influence how these vessels are maintained and kept healthy.



## VITAMIN B12 | VERY HIGH

NUTRIENTS

Vitamin B12 is an essential vitamin that works together with folate and other B vitamins. It's a major player in maintaining the health of both brain and blood cells, as well as the synthesis of DNA. Vitamin B12 is exclusively available from animal products, but may be made in the gut by bacteria. Genes may affect the availability, metabolism and requirement for Vitamin B12.



## VITAMIN C | LOW

NUTRIENTS

Vitamin C is capable of excreting or neutralizing substances such as toxins and byproducts of normal cellular function that may cause rust-like damage within our cells. It is also a key nutrient in the health of our collagen and blood vessels and assists in iron absorption, and wound healing. Certain genes show us how effective we are at activating vitamin C for use in these functions.



## VITAMIN D | MEDIUM

NUTRIENTS

Vitamin D is made in the skin when exposed to sunlight. It is then activated in the liver and kidneys to produce vitamin D3. Vitamin D3 is able to switch multiple genes on, genes that are responsible for the maintenance of bone health and immunity, as well as the health of the hormone, glucose and cardiovascular systems. Variants in the VDR gene impact absorption, metabolism, and utilization of Vitamin D, therefore dietary intervention and increased sun exposure may be required.



## WEIGHT GAIN & WEIGHT LOSS RESISTANCE | VERY HIGH

ENERGY

There is considerable inter-individual variability in our physical ability to lose, gain, or maintain a healthy weight. Certain gene variations affect how we regulate energy and make us more genetically- prone to weight gain and slow weight loss. A one-size-fits-all model does not exist when it comes to how much or how frequently we should eat, or what type of exercise we should do and for how long. Genetic variations can explain, at least in part, how people respond to overeating, exercise, and diet.

# GENES BY PATHWAY

Hugh Raye

3X4 builds Pathways by grouping together genes that together impact a specific metabolic area. Provided are your gene results, grouped by the Pathways they appear in. Both the Pathways and the Gene Results are color-coded, with purple having the highest impact, and light green the lowest impact. Genes with the most significant impact are indicated with a star ★, and genes with a protective impact are indicated with a shield 🛡️

## CELLULAR

METHYLATION	1	OXIDATIVE STRESS	2	DETOXIFICATION	3	INFLAMMATION	4
COMT Val158Met G>A	GA	MNSOD Val16Ala T>C	TT	★ GSTM1 INS/DEL	DEL	IL-1 +/-	+
MTHFR 1298 A>C	AC	PPARGC1A Gly482Ser G>A	GA	CYP1B1 Leu432Val C>G	GG	CRP 2147 G>A	GG
MTHFR 677 C>T	CT	ENOS Glu298Asp G>T	TT	NAT2 R/V/S	Slow	ENOS Glu298Asp G>T	TT
MTR 2756 A>G	GG	GSTM1 INS/DEL	DEL	COMT Val158Met G>A	GA	CYP1B1 Leu432Val C>G	GG
TCN2 776 C>G	GG	NQO1 Pro187Ser C>T	CT	MNSOD Val16Ala T>C	TT	HNMT Thr105Ile C>T	CT
CBS 699 C>T	CT	PPARG Pro12Ala C>G	CC	NQO1 Pro187Ser C>T	CT	MNSOD Val16Ala T>C	TT
MTHFD1 1958 G>A	GA	GPX1 Pro198Leu C>T	CT	CYP17A1 34 T>C	TC	SIRT1 994 T>C	TT
MTRR 66 A>G	AG	HO-1 -413 A>T	AT	CYP2C9 Arg144Cys C>T	CT	FADS1 592 G>T	GT
NBPF3 T>C	TC	PON1 Gln192Arg A>G	AG	MTHFR 677 C>T	CT	HO-1 -413 A>T	AT
NQO1 Pro187Ser C>T	CT	TNFA -308 G>A	GA	PON1 Gln192Arg A>G	AG	IL-6R Asp358Ala A>C	AC
PEMT -744 G>C	GC	🛡️ CAT -262 C>T	CC	ALDH2 Glu504Lys G>A	GG	TNFA -308 G>A	GA
🛡️ BHMT Arg239Glu G>A	GA	ALDH2 Glu504Lys G>A	GG	CYP1A1 Ile462Val A>G	AA	APOE E2/E3/E4	E3/E3
OGG1 Ser326Cys C>G	CC	APOE E2/E3/E4	E3/E3	CYP1A2 -163 A>C	AA	CYP1A1 Ile462Val A>G	AA
		GSTO2 Asn142Asp A>G	AA	CYP1B1 Asn453Ser A>G	AA	DAO His645Asp C>G	CC
		GSTP1 Ile105Val A>G	AA	CYP2C19 *1/*2/*17	*1/*1	FOXO3 G>T	GT
		GSTT1 INS/DEL	INS	CYP2C9 Ile359Leu A>C	AA	FUT2 Trp153Ter G>A	GA
		HFE C282Y/H63D	CC/HH	CYP2D6 *1/*3/*10	*1/*1	HLA DQ 2.2/2.5/8	DQ2.2/DQ2.2
		OGG1 Ser326Cys C>G	CC	CYP3A4 -392 A>G	AA	IL-6 -174 G>C	GG
		UCP1 -3826 A>G	AA	EPHX1 Tyr113His T>C	TT	PPARA 89204 G>C	GG
		UCP2 -866 G>A	GG	GSTO2 Asn142Asp A>G	AA	TIMP4 -55 T>C	CT
		UCP3 -55 C>T	CC	GSTP1 Ala114Val C>T	CC	TNFA -238 G>A	GG
				GSTP1 Ile105Val A>G	AA		
				GSTT1 INS/DEL	INS		
				NAT1 Arg187Gln G>A	GG		
				SULT1A1 Arg213His G>A	GG		

# GENES BY PATHWAY

Hugh Raye

## SYSTEMS

GLUCOSE & INSULIN	1	MEMORY & BRAIN HEALTH	2	COLLAGEN & JOINTS	3	MOOD & BEHAVIOR	4
PPARGC1A Gly482Ser G>A	GA	ENOS Glu298Asp G>T	TT	GDF5 5'UTR C>T	TT	MAOA Arg297Arg G>T	TT
TCF7L2 IVS3 C>T	TT	MNSOD Val16Ala T>C	TT	COL12A1 AluI A>G	AA	DRD1 -48 G>A	GA
FTO 87653 T>A	AA	MTHFR 1298 A>C	AC	VEGFA -2578 C>A	AA	DRD3 Ser9Gly T>C	CT
PPARG Pro12Ala C>G	CC	MTHFR 677 C>T	CT	COL1A1 1546 G>T	GG	DRD4 -521 C>T	TT
ADIPOQ -11391 G>A	GG	MTR 2756 A>G	GG	COL3A1 Ala698Thr G>A	GA	COMT Val158Met G>A	GA
ADIPOQ -395 G>A	GA	NQO1 Pro187Ser C>T	CT	MMP1 -1607 1G/2G	1G/1G	MTHFR 1298 A>C	AC
ADRB2 Arg16Gly A>G	AG	BDNF Val66Met G>A	GA	MMP3 A>G	AG	MTHFR 677 C>T	CT
ADRB2 Gln27Glu C>G	CG	IL-6R Asp358Ala A>C	AC			MTR 2756 A>G	GG
CETP Taq1B G>A	GA	APOE E2/E3/E4	E3/E3			AKT1 G1172+23A T>C	TC
DIO2 Thr92Ala T>C	TC	COMT Val158Met G>A	GA			BDNF Val66Met G>A	GA
IRS1 C>T	CT					OXTR A>G	AG
TNFA -308 G>A	GA					ANK3 318473 C>T	CC
APOA2 -492 T>C	TT					ANK3 A>G	AA
FABP2 Ala54Thr G>A	GG					CACNA1C G>A	GG
FOXO1 A>G	AA					CHRNA5 Asp398Asn G>A	GG
FOXO3 G>T	GT					CHRNA5 C>T	CC
PPARA 89204 G>C	GG					DRD1 -94 G>A	GG
SLC2A2 Thr110Ile C>T	CC					DRD2 TaqIA C>T	CC
UCP2 -866 G>A	GG					FAAH Pro129Thr C>A	CC
						GABRA2 Lys132Lys A>G	AA
						HTR1A -1019 C>G	CC
						OPRM1 Asn40Asp A>G	AA

# GENES BY PATHWAY

Hugh Raye

## SYSTEMS

BONE HEALTH	5	HORMONE BALANCE	6	HISTAMINE OVERLOAD	7
CYP2R1 A>G	GG	CYP1B1 Leu432Val C>G	GG	HNMT Thr105Ile C>T	CT
GDF5 5'UTR C>T	TT	GSTM1 INS/DEL	DEL	HNMT 939 A>G	AG
DIO2 Thr92Ala T>C	TC	COMT Val158Met G>A	GA	DAO C>T	CC
VDR Bsm1 G>A	GA	MNSOD Val16Ala T>C	TT	DAO His645Asp C>G	CC
TIMP4 -55 T>C	CT	CYP17A1 34 T>C	TC		
COL1A1 1546 G>T	GG	MTHFR 677 C>T	CT		
VDR Fok1 T>C	CC	NQO1 Pro187Ser C>T	CT		
VDR Taq1 T>C	TC	CYP19A1 C>T	CC		
		CYP1A1 Ile462Val A>G	AA		
		CYP1B1 Asn453Ser A>G	AA		
		CYP2C19 *1/*2/*17	*1/*1		
		CYP3A4 -392 A>G	AA		
		EPHX1 Tyr113His T>C	TT		
		GSTP1 Ile105Val A>G	AA		
		GSTT1 INS/DEL	INS		
		SHBG Pro185Leu C>T	CC		
		SHBG -68 G>A	GG		
		SRD5A1 A>G	AA		
		SULT1A1 Arg213His G>A	GG		
		UGT2B15 T>G	GG		
		UGT2B17 INS/DEL	INS		

# GENES BY PATHWAY

Hugh Raye

## CARDIOVASCULAR HEALTH

VASCULAR HEALTH	1	CHOLESTEROL	2	BLOOD PRESSURE	3	BLOOD CLOTTING	4
CRP 2147 G>A	GG	IL-6 -174 G>C	GG	ACE2 7132 T>C	TT	ENOS Glu298Asp G>T	TT
ENOS Glu298Asp G>T	TT	CETP G>A	GA	ENOS Glu298Asp G>T	TT	F2 20210 G>A	GG
MTHFR 1298 A>C	AC	CETP Taq1B G>A	GA	AGT Met235Thr A>G	AG	F5 Arg506Gln G>A	GG
AGT Met235Thr A>G	AG	LPL Ser474Ter C>G	CG	ACE Ins/Del	II	HPA-1 T>C	TT
CETP Taq1B G>A	GA	APOA5 C>A	CC	ACE2 A>G	AA		
HO-1 -413 A>T	AT	APOA5 -1131 T>C	TT				
LPL Ser474Ter C>G	CG	APOC3 3175 C>G	CC				
MTHFR 677 C>T	CT	APOE E2/E3/E4	E3/E3				
ACE Ins/Del	II	FABP2 Ala54Thr G>A	GG				
ALDH2 Glu504Lys G>A	GG	TNFA -238 G>A	GG				
APOA5 -1131 T>C	TT						
APOE E2/E3/E4	E3/E3						
F2 20210 G>A	GG						
F5 Arg506Gln G>A	GG						
HPA-1 T>C	TT						
IL-6 -174 G>C	GG						
OGG1 Ser326Cys C>G	CC						
PPARA 89204 G>C	GG						
VEGF -634 G>C	GG						

# GENES BY PATHWAY

Hugh Raye

## ENERGY

PRO-INFLAMMATORY FAT	1	WEIGHT GAIN & WEIGHT LOSS RESISTANCE	2	ADIPOGENESIS	3
IL-1 +/-	+	FTO 87653 T>A	AA	PPARGC1A Gly482Ser G>A	GA
ADIPOQ -11391 G>A	GG	ADIPOQ -11391 G>A	GG	MMP2 Gly226Gly G>C	CC
CRP 2147 G>A	GG	LEPR Lys109Arg A>G	AA	ADRB2 Arg16Gly A>G	AG
ADIPOQ -395 G>A	GA	TCF7L2 IVS3 C>T	TT	ADRB2 Gln27Glu C>G	CG
IL-6R Asp358Ala A>C	AC	MMP2 Gly226Gly G>C	CC	PLIN 11482 G>A	GA
TNFA -308 G>A	GA	ADRB2 Arg16Gly A>G	AG	ADRB3 Trp64Arg T>C	TT
IL-6 -174 G>C	GG	ADRB2 Gln27Glu C>G	CG	FABP2 Ala54Thr G>A	GG
TNFA -238 G>A	GG	LEPR Lys656Asn G>C	GC	PPARG Pro12Ala C>G	CC
		PLIN 11482 G>A	GA		
		ADIPOQ -395 G>A	GA		
		ADRB3 Trp64Arg T>C	TT		
		APOA2 -492 T>C	TT		
		APOA5 -1131 T>C	TT		
		CLOCK 3111 T>C	TT		
		FABP2 Ala54Thr G>A	GG		
		LEPR Gln223Arg A>G	AA		
		MC4R T>C	TT		
		PPARG Pro12Ala C>G	CC		
		UCP1 -3826 A>G	AA		
		UCP2 -866 G>A	GG		
		UCP3 -55 C>T	CC		

# GENES BY PATHWAY

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## ENERGY

EXERCISE RESPONSE	4	ENERGY EXPENDITURE	5	APPETITE/SATIETY/INTAKE	6
FTO 87653 T>A	AA	PPARGC1A Gly482Ser G>A	GA	FTO 87653 T>A	AA
LEPR Lys109Arg A>G	AA	FTO 87653 T>A	AA	LEPR Lys656Asn G>C	GC
ADRB2 Arg16Gly A>G	AG	ADRB2 Arg16Gly A>G	AG	TAS2R38 Ala262Val C>T	CT
ADRB2 Gln27Glu C>G	CG	ADRB2 Gln27Glu C>G	CG	APOA2 -492 T>C	TT
LEPR Lys656Asn G>C	GC	LEPR Lys656Asn G>C	GC	CLOCK 3111 T>C	TT
ADRB3 Trp64Arg T>C	TT	ADRB3 Trp64Arg T>C	TT	DRD2 TaqIA C>T	CC
CLOCK 3111 T>C	TT	CLOCK 3111 T>C	TT	FAAH Pro129Thr C>A	CC
LEPR Gln223Arg A>G	AA	LEPR Gln223Arg A>G	AA	LEPR Gln223Arg A>G	AA
MC4R T>C	TT	LEPR Lys109Arg A>G	AA	LEPR Lys109Arg A>G	AA
		MC4R T>C	TT	MC4R T>C	TT
		UCP1 -3826 A>G	AA	SLC2A2 Thr110Ile C>T	CC
		UCP2 -866 G>A	GG		
		UCP3 -55 C>T	CC		

# GENES BY PATHWAY

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## ACTIVITY

INJURY	1	ENDURANCE	2	RECOVERY	3
COL12A1 AluI A>G	AA	ACE Ins/Del	II	CRP 2147 G>A	GG
GDF5 5'UTR C>T	TT	PPARA 89204 G>C	GG	MNSOD Val16Ala T>C	TT
VEGFA -2578 C>A	AA	AGTR2 A>C	CC	GPX1 Pro198Leu C>T	CT
TNFA -308 G>A	GA	VEGFR2 His472Gln T>A	AA	IL-6R Asp358Ala A>C	AC
COL1A1 1546 G>T	GG	ADRB2 Arg16Gly A>G	AG	● CAT -262 C>T	CC
COL3A1 Ala698Thr G>A	GA	ACTN3 577 R/X	RR	● IL-1 +/-	+
MMP3 A>G	AG	CKM NcoI T>C	CC	IL-6 -174 G>C	GG
		NRF2 A>G	AA	TNFA -308 G>A	GA
		PPARD 294 T>C	TC		
		PPARGC1A Gly482Ser G>A	GA		

POWER	4	TRAINING RESPONSE	5
★ ACTN3 577 R/X	RR	★ ACE Ins/Del	II
CKM NcoI T>C	CC	∨ AMPD1 133 C>T	TT
IL-6 -174 G>C	GG	∨ CKM NcoI T>C	CC
ACVR1B A>G	AG	∨ PPARGC1A Gly482Ser G>A	GA
ADRB2 Arg16Gly A>G	AG	ACSL1 T>C	TC
ADRB2 Gln27Glu C>G	CG	GSTP1 Ile105Val A>G	AA
AGT Met235Thr A>G	AG	HIF1A Pro582Ser C>T	CC
ACE Ins/Del	II	NRF2 A>G	AA
AMPD1 133 C>T	TT	VEGF -634 G>C	GG
HIF1A Pro582Ser C>T	CC		
NOS3 -786 T>C	CC		
PPARGC1A Gly482Ser G>A	GA		
VDR Bsm1 G>A	GA		
VDR Taq1 T>C	TC		

# GENES BY PATHWAY

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## NUTRIENTS

VITAMIN B12	1	FOLATE	2	SALT	3	VITAMIN D	4
★ TCN2 776 C>G	GG	TCN2 776 C>G	GG	★ ACE Ins/Del	II	CYP2R1 A>G	GG
FUT2 Gly258Ser G>A	GA	MTHFD1 1958 G>A	GA	AGT Met235Thr A>G	AG	GC A>C	AC
		MTHFR 677 C>T	CT			VDR Bsm1 G>A	GA
		MTHFR 1298 A>C	AC			VDR Fok1 T>C	CC
						VDR Taq1 T>C	TC

CHOLINE	5	FATTY ACIDS	6	CAFFEINE	7
MTHFD1 1958 G>A	GA	FADS1 592 G>T	GT	COMT Val158Met G>A	GA
PEMT -744 G>C	GC	APOA2 -492 T>C	TT	NAT2 R/I/S	Slow
● BHMT Arg239Glu G>A	GA	FADS2 C>G	CC	● CYP1A2 -163 A>C	AA

VITAMIN C	8	GLUTEN	9	IRON OVERLOAD	10
GSTO2 Asn142Asp A>G	AA	HLA DQ 2.2/2.5/8	DQ2.2/DQ2.2	HFE C282Y/H63D	CC/HH
SLC23A1 790 G>A	GG				

