KASHI HEALTH

Delivering More Than A Test Result

WEIGHT MANAGEMENT PANEL

Genetic Analysis Report

PATIENT:

Johnny Health
DOB:04/19/17
170419001HLA

ORDERING PROVIDER:

Not Provided

TESTING INFORMATION:

Date Collected:	04/19/17
Date Tested:	04/19/17
Date Reported:	04/19/17

GENE MARKER	NORMAL	TEST RESULT	RISK ALLELE	ASSOCIATION	FOOD INTAKE GOALS PROTEIN	FATS	CARBS	RECOMMENDED EXERCISE INTENSITY
FTO	TT	AT	◐	Appetite regulation and craving frequency	25%	20%	55%	Moderate
MC4R	TT	CT	◐	Satiation and metabolism regulation	30%	20%	50%	High
FABP2	GG	AA	●	Dietary fat sources and fat utilization	30%	20%	50%	Low & Resistance
ADRB2	CC	CC	○	Carbohydrate digestion and physical activity				
SH2B1	AA	AA	○	Regulation of leptin and insulin				

RISK ALLELE KEY: ○ No Risk ◐ Risk Allele Heterozygous ● Risk Allele Homozygous

COMMENTS: KEY ASPECTS FOR CONSIDERATION

FTO	|	AT	Weight gain likely around midsection and a greater increase in body mass. Increased risk of developing obesity in adulthood. Cravings for calorie-dense and high-fat foods. Reduced feelings of fullness after meals.
MC4R	|	CT	Reduced sense of fullness after meals. Frequently craving calorie dense and high fat foods. Increased perception of hunger leading to weight gain. Excessive snacking behavior. Increased risk for weight gain for sedentary individuals.
FABP2	|	AA	Increased ability for the body to produce and store fat. Higher fasting plasma glucose and lipid concentrations. Greater possible risk of developing cardiovascular disease and diabetes. Resistance to weight loss by traditional aerobic exercise from compromised resting metabolic rate.
ADRB2	|	CC	No increased risk
SH2B1	|	AA	No increased risk

DIET RECOMMENDATIONS

Eat a higher amount of calories from protein which digests slowly, and a lower amount of calories from fat, thus encouraging use of existing fat stores. Substitute saturated fat with polyunsaturated and monounsaturated fat choices such as olive oil, almonds, cashews and avocados. Excess fat in the liver leads to high levels of insulin and glucose in the bloodstream which can lead to weight gain, insulin resistance, metabolic syndrome, and eventually diabetes. Choose complex carbohydrates like whole grains, low starch vegetables, and fruits with skin to increase fiber. This helps to control food cravings, blood sugar levels, leptin levels, insulin levels, and fat in the bloodstream. Eat five or more small meals a day which will help minimize hunger spikes, reduce inadvertent overeating, support an increased metabolism, and regulate insulin demand.

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EXERCISE INTENSITY GUIDE

Studies have shown that the following exercise schedules and regimes can contribute to weight loss success.

GENE MARKER	TARGET ZONE	HR MAX% BPM RANGE	DURATION	FREQUENCY	TRAINING BENEFIT
	MAXIMUM 5	90 - 100% 171-190 bpm	Less Than 5 Minutes		Benefits: Increases maximum sprint race speed Feels like: Very exhausting for breathing and muscles Recommended for: Very fit people with an athletic training background
MC4R	HIGH 4	80 - 90% 152-171 bpm	2 - 10 Minutes	50 - 60 Minutes Per Day	Benefits: Increases maximum performance capacity Feels like: Muscular fatigue and heavy breathing Recommended for: Fit users, short exercise and for fat burning
FTO SH2B1	MODERATE 3	70 - 80% 133-151 bpm	10 - 40 Minutes	30 - 60 Minutes Per Day 5 - 7 Days Per Week	Benefits: Improves aerobic fitness Feels like: Light muscular fatigue, easy breathing, moderate sweating Recommended for: Everybody for typical, moderately long exercises
ADRB2 FABP2	LOW 2	60 - 70% 114-132 bpm	40 - 80 Minutes	60 Minutes Per Day Before Meals	Benefits: Improves basic endurance and helps recovery Feels like: Comfortable, easy breathing, low muscle load, light sweating Recommended for: Everybody for longer and frequently repeated shorter exercises
	VERY LOW 1	50 - 60% 104-113 bpm	20 - 40 Minutes		Benefits: Improves overall health and metabolism, helps recovery Feels like: Very easy for breathing and muscles Recommended for: Basic training for novice exercises, weight management and active recovery

HELPFUL DIET RECOMMENDATIONS AND TIPS

- Fructose and added sugars. Become an expert in hidden sugars in foods; read labels to see how much sugar is in packaged food.
- Green Tea – find the flavor of green tea that you like and drink 3-5 cups a day. Green tea has been shown to influence the regulation of weight and can help with mood.
- Flavonoids are a nutrient group known for antioxidant and anti-inflammatory benefits. Eat 8 helpings a day of flavonoids e.g. blueberries, onions, apples, kale, nuts, seeds.
- Curcumin (turmeric) can improve leptin resistance, try making curries or taking a daily supplement.
- The right fats: Avoid trans fats, choose polyunsaturated fats which will help insulin secretion and support healthy glucose levels.
- Nutritional Supplement Protocol

LIFESTYLE RECOMMENDATIONS

- Mindful eating. Chew food slowly, mixing saliva with the food to help prepare it for digestion. The more chewed and wet the food is by the time you swallow, the easier it is digested and absorbed through the intestine wall. Chewing also helps stimulate release of enzymes that break down free fatty acids.
- Stress Management. Research shows a distinct and strong relationship between obesity and levels of the stress hormone cortisol. Managing stress is a critical part of weight management.
- Meditation has been shown to modulate the stress hormones and neurotransmitters in the brain. With balanced levels of stress chemicals there is less likely to be binge or emotional comforting eating. Meditation can last from 5-20 minutes as many times a day as you need to take a big deep breath and relax.
- Sleep. Humans need sleep for rebuilding and repair of normal daily damage as well as to cement learning. Sleep also regulates hormones such as leptin. At least 7-8 hours of sleep a night will reduce leptin levels and therefore reduce night time eating. The risk of obesity significantly increases at less than 6 hours sleep per night.

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SCIENTIFIC DETAILS

FTO

FTO, also known as the human fat-mass and obesity-associated gene, is found on chromosome 16. Discovered in 2007 it is one of the strongest genetic risk factors for obesity. Frayling et al, found a significant association between weight, Body Mass Index and the FTO risk allele in over 38,000 participants. It was determined that adults who have two copies of the risk allele weighed an average of 6.6 pounds more and had a 1.7-fold increased risk of developing obesity when compared with those not carrying a risk allele. The association has been confirmed in multiple populations of differing ethnicities. FTO carriers appear to have a higher amount of FTO expression in the brain and body which has been shown to result in an imbalance that increases the risk of becoming overweight. This risk may result in a preference for high-calorie foods or decreased feelings of satiety. It has been recently shown that individuals with this variant do respond well to dietary, physical activity, or drug based weight loss interventions.

MC4R

Melanocortin 4 Receptor refers to a gene found on chromosome 18 and the receptor that this gene creates. The MC4R is located in the hypothalamus, a region of the brain responsible for appetite (among many other functions). Mutations in and near the MC4R gene account for up to 6% of severe early-onset obesity cases, suggesting an important role for the central melanocortin system in the maintenance of normal body weight. The MC4R risk allele has been linked to obesity, diminished insulin response in the brain, altered eating behaviors, and is believed to impair MC4R function. There is a tendency for increased appetite and a preference for calorie-dense foods. However, studies in children and teens show that even though carriers of the high risk allele near MC4R are more prone to weight gain, homozygous variant carriers may be even more responsive to lifestyle modifications than non-carriers or heterozygotes.

FABP2

Fatty Acid Binding Protein 2 is the intracellular protein product of a gene found on chromosome 4. The FABP2 protein helps in fat transportation and absorption, specifically in mobilizing fat from the small intestine into circulation for downstream deposit and storage in fat cells and the liver. FABP2 variants result in increased absorption and transportation of fats in the body. This variant has also been linked to type 2 diabetes mellitus risk in certain ethnic populations. Controlling the amount and types of fat in your diet, particularly saturated fat, is important for weight management in individuals with this variant allele.

ADRB2

The Beta-2 adrenergic receptor is a gene found on chromosome 5 that codes for a receptor located on cells of various tissues including liver and fat cells. Research suggests that mutations in the ADRB2 gene may be important risk factors for the development of obesity and may affect how an individual's weight changes in response to exercise or a carbohydrate rich diet. Women in particular who have this risk allele could benefit from lower carbohydrate intake. Some studies suggest that the ADRB2 variant may lower the rate of fat metabolism during the workout recovery phase although this is currently not conclusive.

SH2B1

The Sarcoma homology 2B adaptor protein 1 refers to a gene found on chromosome 16 *and* the protein that the gene produces. This protein is critical in maintaining the balance of insulin and leptin in the body. Insulin helps control blood sugar (glucose) and is strongly influenced by dietary fat and carbohydrate. Insulin is well known as a factor in diabetes. The hormone leptin is important in regulating appetite and the *feeling* of hunger through its impact on ghrelin, the hormone associated with initiating hunger. The body can become leptin resistant in the same way it can become insulin resistant, reducing leptin's ability to impact ghrelin production. The SH2B1 risk allele results in an altered form of the adapter protein that impairs insulin and leptin signaling resulting in increased appetite and associated weight gain. Controlling intake of fat and carbohydrate is important along with regular exercise to improve leptin signaling.

Please contact Kashi Clinical Laboratories at info@kashilab.com to request a full bibliography.

*This test detects only specific targeted mutations and there is a possibility that other genetic mutations are present that are not detected by this test. The content of this report is provided for information purposes only not as a diagnostic tool, and does not supersede the judgement of the medical provider. Weight management is affected by many non-genetic factors in addition to genes, and this test is not a substitute for a comprehensive consideration of all factors that influence the maintenance of healthy body weight. This test is not FDA approved but its performance characteristics have been established and maintained by Kashi Clinical Laboratories under CLIA and CAP compliance.

Reported and Reviewed By:

Zahra Mehdizadeh Kashi, Ph.D., HCLD
CEO and Laboratory Director

MORE ON GENETIC TESTING

Each body has its own genetic code called DNA. The code has an alphabet with only four letters: A,G,T and C, which are the four nucleotide bases which make up the DNA: Adenine (A), Guanine (G), Thymine (T) and Cytosine(C). Unlike a book or computer screen, DNA isn't flat, it is a curved ladder shape called a double helix. The letters of the DNA alphabet make up the rungs, while special sugars and other atoms make up the handrail. A and T are usually paired together to make a rung, and C and G are usually paired together to make a rung. In each pair of letters, one will come from the father and one will come from the mother. This can give three possible combinations or variants, for example: AA, TT, or AT. For many genes the actual variation doesn't particularly matter. However, as researchers learn about what each gene codes for, there is now more and more information available about which gene pair variants do make a difference to health.

For example: FTO is a gene that controls appetite and cravings. Everybody inherits two versions (alleles) of the FTO gene, one from each parent. Therefore, it is possible to have two alleles coding for the more active variant (called TT), two alleles resulting in the less active variant (called AA) or one of each (called AT). Each combination is called a genotype. The properly functioning genotype is TT.

For someone with the less active "AA" version of the gene, it may mean that the gene may not properly process the information needed to create a well-functioning FTO protein, thus this inefficient protein may lead to excess body weight gain. Research on the FTO gene is still in the very early stages, but some studies suggest that people with the AA version of FTO weigh an average of 6.6 pounds more and have an increased risk of obesity compared to people with the TT version. Individuals with the combination gene (AT) weigh on average 2.5 pounds more compared with people with the TT version.

These genetic variants that are inherited from your parents are known as Single Nucleotide Polymorphisms, or SNPs (pronounced "snips"). SNPs can act as biological markers, helping scientists locate gene alleles that are associated with disease. Some of these genetic differences, have proven to be very important in the study of human health. Researchers have found SNPs that may help predict an individual's response to certain drugs, susceptibility to environmental factors such as toxins, and the risk of developing particular diseases. SNPs can also be used to track the inheritance of disease-related genes within families. Future studies will work to identify SNPs associated with complex diseases such as heart disease, diabetes, and cancer.

A person's genotype is the special allele combination that is in his or her genetic make-up. A person's phenotype refers to all the final observable physical features. These features are the result of the interaction between the person's genotype and the environment (including nutrition, exercise, stress) while he or she was growing up or developing. Weight is an example of a phenotype.

Glossary:

Genotype — the genetic make-up of a particular gene

Allele — any of the alternative forms of a gene that may occur at a given locus

Risk Allele — a significant gene variant that can have an influence on health

Phenotype — the observable properties of an organism that are produced by the interaction of the genotype and the environment

Receptor — a structure on the surface of a cell (or inside a cell) that selectively receives and binds a specific substance

Mutation — a permanent change in the nucleotide sequence of a gene

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