Genetics’ Impact on Weight Loss Resistance

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Genetics’ Impact on Weight Loss Resistance

JJ Virgin, CNS, CHFI
Nutrition & Fitness Expert
What is Weight Loss Resistance

- Failure to lose 1-3# of fat consistently each week with > 25 BMI despite following a sound diet & exercise program
What is Weight Loss Resistance

• The body is not a bank account, it’s a chemistry lab influenced by a multitude of factors including:
  – Stress & sleep
  – Digestion & gut bacterial overgrowth
  – Toxic burden & food sensitivities
  – Hormone imbalances & deficiencies (thyroid, insulin, sex hormones)
  – Genetics
What is Weight Loss Resistance

Human Obesity: A Heritable Neurobehavioral Disorder That Is Highly Sensitive to Environmental Conditions

- Notably, a number of single gene disorders resulting in human obesity have been uncovered and, strikingly, all of these defects impair the central control of food intake.
- While the rising prevalence of obesity is related to increasing ease of access to high-energy palatable food combined with diminishing requirement for physical activity, differences in inter-individual susceptibility to obesity are likely to be related to inherited variation in the efficiency of central control mechanisms influencing eating behavior.

Stephen o’Rahilly and I. Sadaf Farooqi

Diabetes: November 2008 vol. 57 no. 11 2905-2910
Genetic Factors that Impact Obesity

- Genetic likelihood of obesity
- Reduced HDL, increased LDL cholesterol, elevated triglycerides
- Elevated blood sugar
- Leptin, insulin, adiponectin
- Eating behavior traits
- Food reactions/tastes
- Nutritional needs
- Diet type
- Type of/response to exercise
- Tendency to regain weight
- Metabolism
- Lactose intolerance
Stanford Study on Customized Genetics Diet

- Individuals on a diet identified as appropriate to their genotype by the Weight Management Genetic Test lost an average of over 2.5 times more weight than individuals on diets that were not appropriate.

– Stanford University, March 2010
Stanford University Study (March 2010)

Dietary DNA | How a genetic variation affected weight loss in a study of four popular diets

Among 133 overweight women over one year, study participants with:

- Low-fat gene
- Low-carb gene

Average percentage of intake from fat for each diet:

- 21%
- 30%
- 35%
- 47%

Weight loss:

- Ornish diet: 14.1% (3.1)
- Learn diet: 10.1% (5.3%)
- Zone diet: 6.8% (5.3%)
- Atkins diet: 12.3% (2.2)

Average percentage of intake from carbs for each diet:

- 27%
- 42%
- 56%

Source: Interleukin Genetics

Photos (top to bottom): Ivy Books; American Health Publishing Co.; Regan Books; M. Evans and Company
Fruit fly research suggests that genetic interaction with diet primarily determines variations in metabolic traits such as body weight, as opposed to diet alone. This helps explain why some diets work better for some people than others, and suggests that future diets should be tailored to an individual’s genes.
Why Fad Diets Work Well For Some & Not For Others

• Genetics, Vol. 185, 1009-1019, July 2010, doi:10.1534/genetics.109.113571

• Genotype-by-Diet Interactions Drive Metabolic Phenotype Variation in Drosophila melanogaster

• Laura K. Reed*, Stephanie Williams*, Mastafa Springfield*, Julie Brown*, Kenda Freeman*, Christie E. DesRoches, Marla B. Sokolowski and Greg Gibson*
Eating Behavior Traits

• Indeed, we have known for 40 years or more that quantitative measures of such appetite-related variables are clearly linked to obesity(1) and that measurable and stable measures of eating behavior are heritable(2).


The notion that genes can affect our apparently voluntary behavior is understandably uncomfortable to many.
Eating Behavior Traits: Hunger & Satiety

- **Hunger**- above average feeling of hunger, variation in NMB gene (NMB-rs1051168)
- **Satiety**- reduced postprandial feeling of fullness, FTO gene variation (FTO-rs9939609)
- Strategies:
  - Dietary fat, protein and fiber
  - Water in between meals
  - Neurotransmitter balance
  - High Response Costs foods – soups, non starchy veggies, salads
  - Slow down, chew more, put fork down
Eating Behavior Traits: Hunger & Satiety

Eating Behavior Traits: Snacking

- Increased **snacking** behavior
- Variants in the leptin receptor LEPR rs2025804
- Divide daily caloric and macronutrient needs between mini-meals and eat every 2-3 hours
- Carry “emergency food” with you
- Plan healthy snacks and meals
- Use smaller plates and serving containers
Eating Behavior Traits: Snacking

Eating Behavior Traits: Eating Disinhibition & Food Desire

- **Eating Disinhibition** - eat more than normal in response to a stimulus
  - Gene variant in TAS2R38-rs176866

- **Food Desire** - willingness to make an extra effort to get their favorite foods
  - Gene Tested: ANKK1/DRD2-rs1800497
Eating Behavior Traits: Eating Disinhibition & Food Desire

Strategies:
• Remove food triggers and avoid challenging situations (e.g. “all you can eat buffets”)
• Don’t make seconds easily available
• Go out for limited amount of “treat/trigger food” with accountability partner
• Brush teeth/mint directly afterward eating
• Manage stress
• Replace eating with other pleasurable activities
Eating Behavior Traits: Eating Disinhibition & Food Desire

Eating Behavior Traits: Sweet Tooth

- **Sweet Tooth** - craving sweet foods
  - Gene Variant in SLC2A2-rs5400
- Strategies:
  - Retrain taste buds; exposure increases preference
  - Maintain good serotonin levels
  - Ensure optimal protein intake and digestion
  - Keep blood sugar balanced, consider supplementation
  - Eat low glycemic index, slow release carbs
  - Xylitol, stevia, cinnamon and vanilla
Eating Behavior Traits: Sweet Tooth

Food Reactions: Sweet Taste

• Gene variant in TAS1R3-rs35744813
• Receptors on tongue programmed by your genes determine how you taste sweetness
• “Decreased” sensitivity sweet tasters prefer sweeter foods as they are less likely to taste sweetness
Food Reactions: Sweet Taste

Food Reactions: Bitter Taster

• Genes variants in TAS2R38-rs713598, TAS2R38-rs1726866
• **Taster**, Non-taster or inconclusive in response to chemical PTC
• Taster may also have preference towards salty foods
• Tasters often sensitive to bitter flavors (coffee, grapefruit, dark chocolate, cruciferous vegetables)
Food Reactions: Bitter Taster

Case Studies

• **Amber** – inconclusive bitter taste gene variant, eating behaviors ‘trifecta’ – variants for eating disinhibition, food desire, hunger
Case Studies

• Victor – bitter taster, elevated blood sugar, increased hunger, decreased satiety, increased food desire, lactose intolerant, more likely to gain weight back, high risk for obesity, low fat diet recommendation, increased need for exercise for weight loss, blood pressure response
Genetic Testing Can Help Change Behavior

People who find out they have high genetic risk for cardiovascular disease are more likely to change their diet and exercise patterns than are those who learn they have a high risk from family history, according to preliminary research.

Findings from [a personalized medicine study](Coriell Institute for Medical Research, a non-profit research institute based in Camden, NJ)
Genetic Customization: The Future of Fat Loss & Weight Management

Of 452 randomly selected adults in Germany, 45% of respondents claimed they would participate in genetic risk profiling in order to receive personalized nutrition advice and functional food products adapted to their individual nutrigenetic profile.