

Metabolism – Fact vs Fiction

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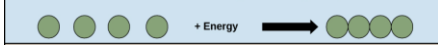
What is Metabolism?

Metabolism is the body's ability to utilize for essential biomolecules or macromolecules

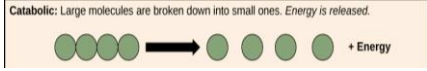
Anabolic Pathways

Metabolic pathways

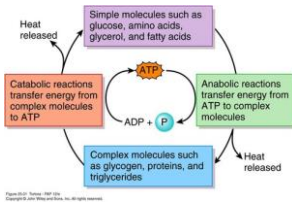
Anabolic: Small molecules are assembled into large ones. Energy is required.



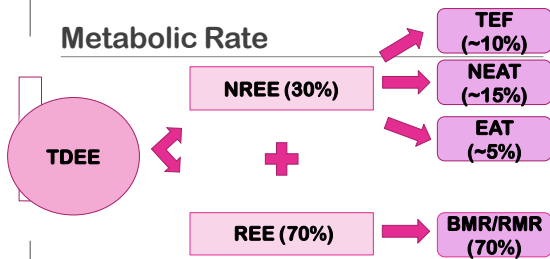
Catabolic Pathways



Catabolism Fuels Anabolism



Metabolic Rate



Fact vs Fiction

You just need to follow the energy balance equation to lose weight

Static Energy Balance Equations

Weight Maintenance = Energy Balance

- Energy balance is important for maintaining a healthy weight.
- Energy IN = Energy OUT

Weight Gain = Positive Energy Balance

- Energy IN > Energy OUT

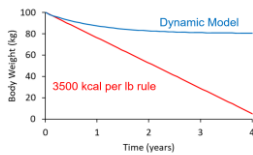
Weight Loss = Negative Energy Balance

- Energy IN < Energy OUT



Dynamic Energy Balance Equation

Corrected Weight Loss Projections

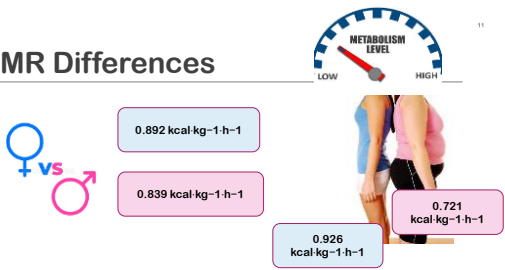


KD Hill et al. The Lancet 378:826-37 (2011)

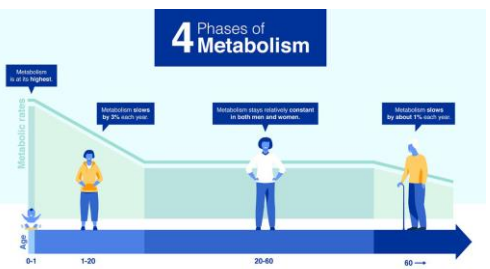
Fact vs Fiction

I have a low metabolic rate

RMR Differences



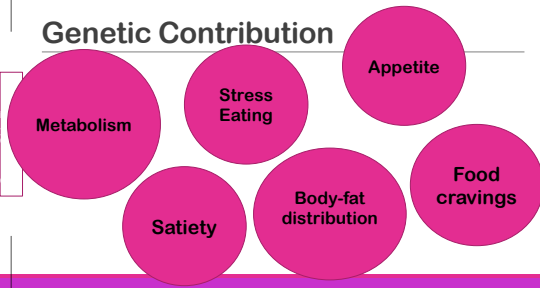
4 Phases of Metabolism



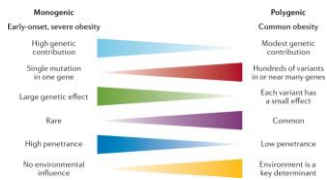
Fact vs Fiction

It's in my genes!

Genetic Contribution



Monogenic vs Polygenic



Categories for Genes

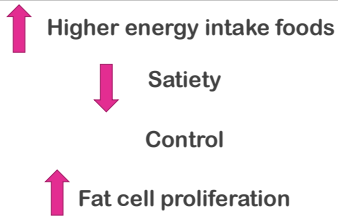
Regulation of food intake by molecular signaling in the hypothalamus and hindbrain by signals originating in adipose tissue, gut and other organs

Regulation of adipocyte differentiation and fat storage

Regulation of spontaneous exercise activity

Effect on basal and postprandial thermogenesis

FTO Gene



Selected Genes Associated with Obesity

Gene symbol	Gene name	Gene product's role in energy balance
ADIPOQ	Adipocyte, C1q, and collagen domain-containing	Produced by fat cells, adiponectin promotes energy expenditure
FTO	Fat mass- and obesity-associated gene	Promotes food intake
LEP	Leptin	Produced by fat cells
LEPR	Leptin receptor	When bound by leptin, inhibits appetite
INSIG2	Insulin-induced gene 2	Regulation of cholesterol and fatty acid synthesis
MCR4	Melanocortin 4 receptor	When bound by alpha-melanocyte stimulating hormone, stimulates appetite
PCSK1	Proprotein convertase subtilisin/kexin type 1	Regulates insulin biosynthesis
PPARG	Peroxisome proliferator-activated receptor gamma	Stimulates lipid uptake and development of fat tissue

Strong Contribution

Overweight for much of life.

One or both of parents or several other blood relatives are significantly overweight.

Can't lose weight even when there is an increase physical activity and stick to a low-calorie diet for many months.

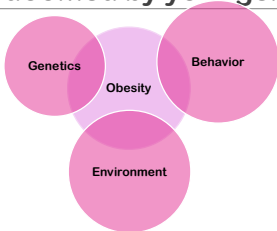
Low Contribution

Strongly influenced by the availability of food.

Moderately overweight, but can lose weight when a reasonable diet and exercise program is followed.

Regain lost weight during the holiday season, after changing eating or exercise habits, or when psychological or social problems are experienced.

Are you doomed by your genes?



Environmental Issues

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Fact vs Fiction

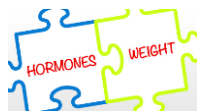
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Hormones are wreaking havoc on my weight!

Anabolic Hormones

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- Growth Hormone
- Insulin
- Estrogen
- Testosterone



Catabolic Hormones

- Adrenaline or epinephrine
- Cortisol
- Glucagon

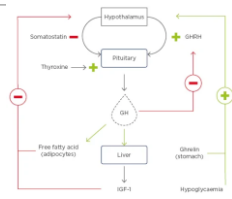


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Growth Hormone

Suppresses glucose uptake and glucose oxidation, and stimulates gluconeogenesis, glycogenesis, and lipolysis

- ↓ Age
- ↓ Lean body mass
- ↑ Body Fat



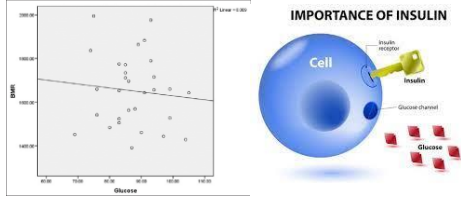
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GH Production Regulation



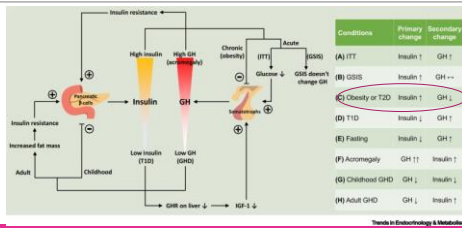
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Insulin



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Growth Hormone x Insulin

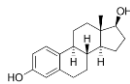


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Estrogen

Produced in ovaries, adrenal gland, and adipose tissue

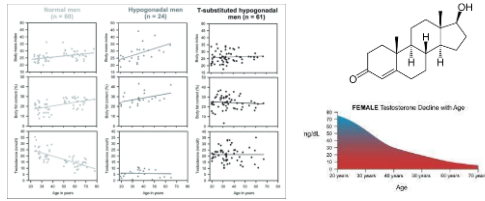
↓ May reduce metabolic rate



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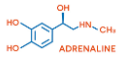
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Testosterone



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Epinephrine



Fight or flight



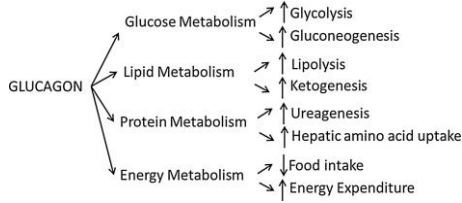
Temporary hold on eating

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Cortisol



Glucagon



Fact vs Fiction

To increase my metabolic rate I need to resistance train

How does resistance training increases TDEE?



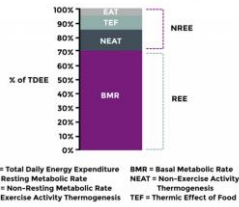
Chronic Resistance Training

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- Frequency of program
- Intensity of program
- Predominate fiber type
- Hormonal environment
- Nutritional environment

Bottom Line.....

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