Nutrigenomics

Kimberly Kreitinger
What is Nutrigenomics?

- Study of how nutrients affect the expression of genes
- Can be used to prevent diseases
- Nutrigenetics (subset of Nutrigenomics)
  - Determines how an individual’s genetic information is affected by diet
History

• Nutrient research shifted from epidemiology to genetics in past decade
  – Completion of Human Genome Project
  – Realization that there are genetic predispositions to diseases linked to diet
    • Cardiovascular disease
    • Cancers
    • Diabetes Type II
Future Potential

- Form dietary-intervention strategies for individuals in order to prevent diseases
- Change the business models for supplement and food industries
- Validate claims for food products
How Do Nutrients Affect Genes?

- Nutrients act as ligands and bind to transcription factors, resulting in the repression or activation of various genes.
Tools

- Cell cultures
- DNA microarrays
  - Targets specific genes affected by certain nutrients
- Same tools as genomic tools in terms of research
Caffeinated Coffee

- **Habitual Caffeine Consumption**
  - Based on genetic variant that affects adenosine receptor

- **Increased Risk of Heart Disease**
  - Carriers of a gene associated with slow caffeine metabolism

- **Decreased Risk of Heart Disease**
  - Carriers of a gene associated with fast caffeine metabolism
  - One to three cups of coffee a day
Folic Acid

• Involved in methylation of DNA
  – Undermethylation of DNA, associated with growth of cancer cells, detected in humans with diets deficient in folic acid

• Regulates gene that forms methylenetetrahydrofolate reductase (MTHFR)
  – CC/CT individuals: normal
  – TT individuals: increased risk of vascular disease and premature cognitive decline

• Normal with higher intake of folic acid
Polyunsaturated Fatty Acid

• Examples: omega-3 fatty acids (fish), omega-6 fatty acids (vegetable oils)

• Regulates Apolipoprotein A-I gene, which is associated with the production of high-density lipoproteins (HDL)
  – HDL is associated with a decrease risk in coronary heart disease
  – Women:
    • AA/AG: Polyunsaturated fatty acids increase HDL, thus decreasing risk of coronary heart disease
    • GG: Polyunsaturated fatty acids decrease HDL, thus increasing risk of coronary heart disease
Theaflavins

- Found in black tea
- Represses genes associated with inflammation
  - Example: regulates gene that codes for COX-2, an enzyme associated with pain and inflammation
Problems

- Food is highly variable
- Effects of food are not immediate
- Diseases are usually affected by many genes
- Functions of most genes have yet to be determined
- Tissue or organ responsible for affect of nutrient not always known
- Funding for research
Businesses

- **WellGen**
  - Inflammation
    - WG0401 Patented Enriched Extract from Black Tea
  - Current Project: Obesity
- **Salugen**
  - Use individual genetic profiles to come up with nutritional regiment
  - Products:
    - HAVEOS- substance abuse and narcotic tolerance
    - GenoTrim- excess cravings contributing to weight problems
    - SpaGen- skin and mental well-being
- **Others:** Sciona, Suracell, GeneSNP, Gensona, GeneWize
Ethical Issues

• Lack of genomic education on the part of the consumer
• Direct-to-Consumer tests have questionable efficiencies
Work Cited


