



Course Title: Diet and Gene Expression: You Are What You Eat

Course Code: WSP 375

Instructor: Lucia Aronica, PhD

Course Summary:

There is a give and take between our genes and the food we eat: genes affect nutrient response through genetics, while nutrients affect gene activity through epigenetics. This is a course for those interested in understanding the basic science of diet-gene interactions, and bringing it into their kitchen to optimize their health and defense against disease.

Learning Outcomes:

1. Describe key molecular epigenetic mechanisms and their regulation by diet and environmental toxicants.
2. Review and evaluate relevant literature in the field.
3. Acquire an appreciation of current applications and future directions of genetics and epigenetics in precision health.
4. Assess the limitations to the implementation of personalized nutrition based on genetics and epigenetics.
5. Critically evaluate the coverage of epigenetics and nutrigenetics in the media, identify common misrepresentations, and disentangle facts from fiction.

**Please see course page for full description and additional details.*

Grade Options and Requirements:

- No Grade Requested (NGR)
 - This is the default option. No work will be required; no credit shall be received; no proof of attendance can be provided.
- Credit/No Credit (CR/NC)
 - Students must participate in both class sessions.

***Please Note:** *If you require proof that you completed a Continuing Studies course for any reason (for example, employer reimbursement), you must choose the Credit/No Credit option. Courses taken for NGR will not appear on official transcripts or grade reports.*

Jan 25	Topics, Readings and Media
10:00-11:00	<p>Course Overview Genetics Refresher Intro to Epigenetics Epigenetics and the environment</p> <p>Required readings/media</p> <p>My blackboard videos on epigenetics: Epigenetics Intro Epigenome and Environment</p> <p>Additional resources: Podcast Interview about my research at Stanford</p> <p>Epigenetic analysis in the DIETFITS study (Dr. Lucia Aronica and Prof. Christopher Gardner)</p> <p>Short video: Insights from identical twins, University of Utah Research news: Hidden Treasures in Junk DNA</p> <p>Research news: Researchers take a gamble on the human genome</p> <p>Video: Human Genome Announcement at the White House (2000)</p> <p>Media coverage: Epigenetics 101</p>
11:00-11:30	<p>Epigenetic Modifications and Mechanisms of Action</p> <p>Required readings/media The molecular hallmarks of epigenetic control. (Nat Rev Genet 2016)</p>
11:30-12:30	<p>Diet and Gene Expression: From Honey Bees to Humans</p> <p>Required readings/media</p> <p>Research news: Mother's diet changes pups' colour (2003)</p> <p>Additional resources: Video lecture: Epigenetics and Diet BBC Radio show: Can Your Lifestyle Be Passed on to Future Generations?</p> <p>Deep dives (for those who want to read about the science behind the topic):</p>

	<p>Persistent epigenetic modifications in Dutch famine babies Obesity changes sperm epigenome</p> <p>Research reviews: The Dutch Hunger Winter and the developmental origins of health and disease</p> <p>Book chapter: Environmental Epigenomics in Health & Disease, Ch 1. Courtesy of Prof Randy Jirtle</p>
12:30-13:30	Lunch break
13:30-14:30	Interview with Prof Randy Jirtle: Epigenetic transgenerational effects of diet
14:30-15:30	<p>EPI-nutrients</p> <p>Methyl-donating nutrients: Folate</p> <p>Nutrigenomic modulators: Sulforaphane</p> <p>Broccoli sprouts DIY demo</p> <p>Required readings/media</p> <p>EPI-nutrient summary: SOUL-food insights_Lucia Aronica</p> <p>Research news:</p> <p>Could eating broccoli starve out cancer?</p> <p>The Epigenetic Benefits of Your Thanksgiving Feast</p> <p>Deep dives:</p> <p>Folate and the One-Carbon Metabolism in Health and Disease</p> <p>Food fortification with folic acid</p> <p>Vegetarians and B12</p> <p>Bioavailability and inter-conversion of sulforaphane and erucin in human subjects consuming broccoli sprouts or broccoli supplement in a cross-over study design.</p> <p>Sulforaphane, epigenetic writers and erasers</p> <p>Broccoli help detox your body from air pollutants</p> <p>Mustard seeds to pump up your sulforaphane</p>
15:30-16:00	Takeaways and Q&A

Feb 1	Topics, Readings and Media
10:00-11:00	<p>Environmental epigenetics and EPI-toxins*</p> <p>*Environmental toxicants acting through an epigenetic mechanisms</p> <p>Required readings/media</p> <p>TEDx Talk: Ancestral ghosts in your genome Michael Skinner TEDx</p> <p>Research news:</p> <p>Could chemotherapy affect future generations?</p> <p>Dogs Exposed to BPA Give Us Epigenetic Clues About Our Own Wellbeing</p> <p>Sperm exposure to plastic compounds affects embryo in humans</p> <p>Phthalates increase the risk of allergies among children</p> <p>Additional resources</p> <p>Scorecards: Toxins by ZIP-CODENYT Page on BPA</p> <p>Deep dives</p> <p>Research articles</p> <p>Maternal nutrient supplementation counteracts bisphenol A-induced DNA hypomethylation in early development</p> <p>Epigenetic effects of BPA and phthalates, Skinner lab 2012</p> <p>Epigenetic effects of chemotherapy on sperm cells, Skinner lab 2016</p> <p>In utero phthalate exposure is associated with DNA methylation of growth-related genes in human placenta and fetal grow restriction</p> <p>Epigenetic effects of phthalate and childhood asthma</p> <p>Research reviews:</p> <p>Epigenetic translational inheritance of EDC exposure</p> <p>Epigenetic Effects of Environmental Chemicals Bisphenol A and Phthalates</p> <p>The burden of endocrine-disrupting chemicals in the USA</p> <p>Understanding Epigenetic Effects of Endocrine Disrupting Chemicals: from Mechanisms to Novel Test Methods.</p>
11:00-11:30	Q&A
11:30-12:30	Interview with Prof Micheal Skinner: Epigenetic transgenerational inheritance of environmental exposures

12:30-13:30	Lunch break
13:30-14:30	<p>Introduction to Nutrigenetics Nutrigenetics in direct to consumer testing: food intolerances and micronutrients</p> <p>Deep Dives</p> <p>Gene-Dairy Food Interactions and Health Outcomes: A Review of Nutrigenetic Studies</p> <p>MTHFR alleles in human</p> <p>MTHFR and decreased prostate cancer risk</p> <p>AGTR1, salt and hypertension</p> <p>ADDUCIN, salt and hypertension</p> <p>Coffee, CYP1A2, and risk of heart disease</p>
14:30-15:30	<p>Nutrigenetics in direct to consumer testing: macronutrients</p> <p>ApoE, DHA and Alzheimer's disease</p> <p>APOE ε4 Is Not Associated with Alzheimer's Disease in Elderly Nigerians</p> <p>Effect of APOE ε4 allele on survival and fertility in an adverse environment</p> <p>Apolipoprotein E4 is associated with improved cognitive function in Amazonian forager-horticulturalists with a high parasite burden</p> <p>Genetic variation at the FADS1-FADS2 gene locus influences delta-5 desaturase activity and LC-PUFA proportions after fish oil supplement</p> <p>Additional resources</p> <p>Promethease</p> <p>SNPedia</p>
15:30-16:00	<p>Genetics and epigenetics in personalized nutrition Introduction to Personalized Nutrition</p> <p>Required readings/media</p> <p>The AI Diet, NYT 2019</p> <p>A personalized diet, better suited for you, NYT (2016)</p> <p>Test your genes to find your best diet - WSJ (2016)</p> <p>Ancient DNA can both diminish and defend modern minds</p> <p>Research articles and reviews:</p> <p>Protective alleles and modifier variants in human health and disease</p>