The Intersection of Epigenetics, Education, Environmental Exposures, and Public Health Messaging

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CHE-WA CEH Working Group Meeting
12.11.14

Center for Genomics & Healthcare Equality
http://depts.washington.edu/cghe/
Today’s Goals

- Framing of the project
  - Personal and research interests
- Development of the project
- Challenges, Strategy and Decision-making
- Dissemination of the project
- Discussion questions
- Watch Video
- Think, pair, share
Environmental Embodiment

• Environmental cues lead to change in epigenetic regulation
  • SDoH can become drivers of chronic disease
  • Stress can trigger FAST life course strategy in next generation
  • Chemical exposures can interfere with epigenetic regulation
  • Chemical exposures can prematurely trigger gene networks
Epigenetic Mechanisms

Epigenetic mechanisms are *flexible* genomic parameters that can *alter* genome function under *exogenous* influence.

- Epigenetic change links exposures to disease outcomes
- Methylation examples
  - Bees – Royal Jelly
  - Mouse vs Man
  - Twins & Agouti Mouse
  - GR Receptor Expression
Epigenetic Mediation: DNA Methylation

• Silences gene expression in eukaryotes
  • Jumping Genes: LINE and ALU
  • Global hypomethylation allows activation of jumping genes
  • Global hypomethylation implicated in genomic instability and risk for cancer

• Transposable Elements
  ▪ Retrotransposons: LINEs
    ▪ 30% of the genome
    ▪ Embed into different section of the genome
    ▪ LINEs: 100/500,000 active
Exposures Associated with Hypomethylation

- Global hypomethylators
  - Arsenic
  - Cadmium
  - Methylmercury
  - Lead
  - BPA
  - Pesticides
  - Smog
  - Tobacco Smoke
  - Many more
Epigenetic Mediation: Methylation Timing

Epigenetic reprogramming

- Imprinted Genes
- Repeats (IAPs)
- Paternal Genome
- Maternal Genome

Somatic maintenance

Gametes
Fertilized egg
Blastocyst
Epiblast
Primordial Germ Cells
Gametes

Early Development

PGC Development

Blewitt 2013

Lorelei Walker UW SPH IPHG 2014
MicroRNA

- MicroRNA (miRNA)
  - Non-coding RNA
  - 1-4% of all human genes
  - Target up to half of coding genome
  - Fine tune gene expression
  - Tight control over development
  - Effected by multiple environmental agents

- Diagram showing interaction between miRNA and target mRNA
Video

- To develop a video making the concept of environmental embodiment / epigenetics understandable for the general public.

- Empower citizens
  - Empowers individuals
  - Empowers communities
  - Enables deliberative democracy
  - Increase genetic literacy
  - Understand BPA and EDCs as a risk to health: “pollution is personal”
  - Easy actions to avoid pesticides and BPA containing products
  - Identify those products
Development of Project

• Need:
  • To connect the dots for the public of how environmental exposures can directly affect health outcomes.

• Approached CEEH Outreach Team.
  • Secured a small grant to work with Evan Stuart Productions.
Where Public Health Stands in Messaging

Better Living Through Chemistry
Industry = Jobs
Progress

Extreme Advocacy
Radical

Public Health Messaging?
Epigenetic Video: Domains of Importance

• Guides
  • Plain language; accurate, accessible, and actionable information
  • Positive realistic actions that do not contain judging language

• Decision Needs
  • Audience?
  • Which mechanism to teach
    • Teach global hypomethylation or gene regulation
    • Positive vs negative messaging: Resilience over susceptibility
  • Which exposures
    • Moving away from personal responsibility and towards social justice
  • Which health outcomes
    • Susceptibility vs Causality
  • What actions
Video: Strategy

• Process
  • Sketching mechanism
  • Brainstorming with non-scientific/non-public health videographer
  • Literature review for applicable exposures
  • Key informants
  • Focus groups
  • Executive power (me)
Epigenetic Video: Dissemination

- Vimeo and YouTube
- Twitter
  - @STEMEduc; @ScienceEduc; @science_teacher; @Science_Ed; Retweet: @USC_EH_Outreach; Retweet: @marilynmochel5; Retweet: @ecogenetix & @PHCafe
- Found on smt-source.com
- Facebook
  - IPHG & HEC; Science Teacher Resource; science education & technology; Found on “Epigenetics Research Team”
- Listservs
  - wsffnet@npogroups.org; NW-KIDS-ENV-HEALTH@LISTSERV.WA.GOV; cheiceh@lists.healthandenvironment.org; CGHE Listserv; Beti Thompson's Cohort of farm workers (Spanish Version); Alumni for USF Department of Integrative Biology Page (in progress); SPH YouTube Channel Featured Videos
- Groups
  - WSPHA Poster; NEAR Working Group across DoH employees: Neuroscience Epigenetics ACEs Resilience; Interlake HS Honors Society; Science Educators; March of Dimes WA State Coordinator
- LinkedIn
  - Epigenetics; HELIX Exposome project; Epigenetics Psychology (professionals)
The Video and Reflection

- https://www.youtube.com/watch?v=ujLppvMqUOI

- Watch video with these questions in mind
  - What do you visually notice as you watch the video?
  - What is your takeaway?
  - What about the messaging stands out to you?
  - How did we do?
  - What was missing?
Thank You: Support and Mentorship

- **Funding: Center for Genomics and Healthcare Equality**
  - P50 HG 3374 from the National Human Genome Research Institute
  - Center for Ecogenetics and Environmental Health
- **Mentorship**
  - Institute for Public Health Genetics
    - Dr. Kelly Edwards (Committee Chair)
  - Center for Genomics and Healthcare Equality
    - Dr. Helene Starks (Committee Member)
  - Institute of Neurotoxicology and Neurological Disorders
    - Dr. Steven Gilbert (Committee Member)
  - Transdisciplinary Stress
    - Dr. Paula Nurius (BRFSS and RDA Data on WA State)
  - Department of Anthropology
    - Dr. Dan Eisenberg (GSR)
Prenatal / Fetal Period

Unique time when 3 generations can experience the same exposure.