Change Your Genes – Change Your Life
Sorting Hope from Hype in Epigenetics
Integrative Healthcare Symposium (NY)

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Change Your Genes/Change Your Life
EPIGENETICS
Epigenetics Era

• Health Biomarkers vs Disease Prediction
• Genomics
  – Study of the *entire* genome (Sequencing, Mapping, and Interactions)
• Epigenetics
  – Study of post-translational genetics modifications
• Metabolomics (Genetic Expression)
  – Study of the complete set of metabolites or small molecules (Metabolic Intermediates, Byproducts, Hormones, Signaling Compounds) present in a cell or organism
• Microbiome: Study of all the microbes in and on a person
ENCODE

“Encyclopedia of DNA Elements”

- International Consortium of 32 research institutes (2012)
- Map the 97% “junk” or hidden DNA

Three Major Findings

- “About 80 percent of the genome is biochemically active”
- Over 4 million “spaces” on the DNA strand act as switches that regulate gene expression through “regulatory RNA”
- Disease usually occurs when a structurally normal gene suffers from abnormal regulation (epigenetic variation)

GENETICS
This is how it works
Neolithic Y-Chromosome Bottleneck Culture and Epigenesis

• From 7000 to 5000 years ago, the male genetic diversity in the Y chromosome (fathers pass to sons) collapsed
• Generations of war between patrilineal clans limited the diversity in patrilineal clans
• Conflicts between non-patrilineal clans where both men and women could move between clans … maintained diversity
• “Historical and geographical patterns of cultural interaction could explain the patterns you see in genetics.”

“Something’s just not right—our air is clean, our water is pure, we all get plenty of exercise, everything we eat is organic and free-range, and yet nobody lives past thirty.”
Epigenetics: A Tripartite Assay
Dr Bert Vogelstein – Johns Hopkins University Medical School

Longitudinal study in 2012, compared genomes of thousands of identical twins

Focused on 24 major diseases over 15 years

Parkinson’s risk = 5%; CHD = 50% (random chance); and, Most Cancers = Less than 50%

Whole genome sequencing could alert most individuals to an increased risk of only ONE disease on average

Such sequencing can be misleading since each twin remains susceptible to all other diseases and not the same diseases as the twin
"Bad news, its curiosity"
Single Nucleotide Polymorphisms: Common Genetic Variants SNPs

- SNPs act as a rheostat to express or suppress genetic predisposition
- Genetic Variation: Central to personalized medicine
- SNPs influence by diet/nutrition, stress/meditation, radiation, physical and psychosocial environment, Rxs, endocrine disruptors, and sense of purpose
- >3 million SNPs identified
- Estimated potential 10+ million SNPs in the human genome
- SNPedia: 83,452 Reference SNPs
“You don’t look anything like the long haired, skinny kid I married 25 years ago. I need a DNA sample to make sure it’s still you.”
A Tripartite Assay Pilot Study
Stool Microbiome, Pathogens, and Infectious Agents Among Olympic, Elite Athletes, and Optimally Healthy Adults

RESEARCH DESIGN and PURPOSE:

Olympic athletes, non-Olympic elite athletes, and other optimally healthy adults may have epigenetic and metabolic profiles that are unique. These profiles may contribute to the caliber of their performance, and they may provide keys to understanding select epigenetic and metabolic conditions.

For further details contact:

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What Do We Test

Genetics
- Whole genome base mapping using next generation sequencing technology
- SNP based and whole gene based analytics

Blood
- More than 100 key blood biomarkers covering all key health and wellness problems

Microbiome
- Genome sequencing based microbiome and metabolomics analysis for up to 300 key biomarkers
Genetic biomarker selection criteria:

1. Gene biomarkers are stable from one time of testing to the next by the same laboratory. Genes are stable unless there is a specific intervention that alters them;

2. Changes can be made in the expression of these genes by actionable, modifiable, self care lifestyle interventions;

3. Changes can be detected in a maximum time frame of 10-12 weeks although many change in a matter of hours or days; and

4. Are commercially available.
EPIGENESIS: 7 Pillars of Optimal Health

- **Methylation:** Methyl (CH3) molecules with rheostat to turn genes on and off to govern DNA expression
- **Inflammation:** Acute vs. chronic and destructive
- **Oxidative Stress:** Excessive oxidation (PON1 and SOD2)
- **Detoxification:** Phase One and Phase Two breakdown and excretion of toxins
- **Immunity:** Differentiate self from not self with hypo and hyper immunity
- **Lipid Metabolism:** Genetic expressions govern optimal lipid metabolism
- **Mineral Metabolism:** Govern metabolism of nutrients and trace element from whole foods

“Eat less, exercise more and invent a time machine so you can go back and choose parents with better genetics.”
There are certain known microbial signatures that are closely associated with a number of conditions. Inflammation moderate, IBD high, lactose intolerance low, gluton intolerance low. Important factors for this phenotype:

- Enterobacteriaceae
- Ruminococcaceae
- Gene GC, rs2282679 presence
- Vitamin D
- Fasting Blood Glucose
- HbA1c
- PPAR-R
- Blood
- Genetics

Factors Score

Signature Map

Example Phenotype Signature

Important Factors for this Phenotype

- Enterobacteriaceae: 21% down
- Ruminococcaceae: 11% down
- Gene GC, rs2282679: 9.5% down
- Vitamin D: Insignificant Difference
- Fasting Blood Glucose: Insignificant Difference
- HbA1c: 15% down
- PPAR-R: 26% down
Cardiovascular Health

Your cardiovascular system is made up of your heart and blood vessels, and is responsible for transporting oxygen, nutrients, hormones, and waste products throughout the body. A healthy cardiovascular system ensures a good balance of nutrients and optimal brain and body function.

Basic Lipid Panel

The basic lipid panel includes cholesterol levels (both the good HDL and the bad LDL and other non-HDL cholesterols), as well as triglycerides. Elevated levels of triglycerides or non-HDL cholesterol can increase your risk of cardiovascular disease, which can lead to heart attacks and strokes. Higher levels of artery-clearing HDL, however, can reduce this risk.

<table>
<thead>
<tr>
<th>Total Cholesterol</th>
<th>184</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDL</td>
<td>92</td>
</tr>
<tr>
<td>HDL</td>
<td>68</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>111</td>
</tr>
<tr>
<td>Total to HDL Ratio</td>
<td>2.7</td>
</tr>
<tr>
<td>Triglycerides to HDL Ratio</td>
<td>1.6</td>
</tr>
</tbody>
</table>

LDL Particles

Higher levels of LDL or “bad” cholesterol can result in increased amounts of plaque in your blood vessels, which can obstruct blood and oxygen flow to vital organs. While almost half of those with heart attacks have normal basic lipid panels, two-thirds of heart-attack victims have elevations in other types of LDL particles. By reducing those deeper LDL numbers, you can reduce your risk of a heart attack and stroke.

<table>
<thead>
<tr>
<th>Apo B</th>
<th>64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lp(a) Mass</td>
<td>32</td>
</tr>
<tr>
<td>vLDL-C</td>
<td>29</td>
</tr>
</tbody>
</table>
FOUR DISTINCT CLASSES
Genes - CBC

1. Genes with No Direct Molecular Correlate in Blood
2. Genes with Direct Molecular Correlates in Blood
3. Genes with Direct Pathway/Network Correlates in Blood
4. Genes with Clinical & Molecular Phenotype Correlates

I demand a DNA test!
There are about one trillion bacteria living in the GI tract, ten times higher than the total amount of cells composing the human body.

"Your weight problem is partly genetic and partly Boston Cream pie."
DIETARY RECOMMENDATIONS

1. Reduce your intake of all forms of the “bad fats,” which include saturated fats (such as beef, butter, and cheese) and trans fats (which are found in foods such as margarine or cookies).

2. Increase your consumption of monosaturated fats (such as nuts, avocados, or olive oil) listed earlier.

3. Decrease your intake of harmful carbohydrates (i.e., all refined flours).

4. Increase your consumption of high-quality carbohydrates such as whole grains.
5. Consumer more cruciferous vegetables such as broccoli and cauliflower, which by the way are also able to switch anti-cancer genes.

6. Increase the amount of folic acid in your diet by eating leafy vegetables, sunflower seeds, baker's yeast, and liver.

7. Increase your vitamin B12 intake by eating organic meats, liver, shellfish, and milk.

8. Obtain more vitamin B6 by consuming whole grain products, vegetable, nuts and certain meats.

Pelletier, KR. Change Your Genes, Change Your Life. San Rafael: Origin Press, 2018
Pharmacy

“Don’t take these if you are nursing, pregnant, or about to become pregnant.”
Archives of Internal Medicine

- Longitudinal study of 23,000 individuals over 8 years
- Health benefits of 4 simple practices
  - No Smoking
  - Exercising 3.5 hours/week
  - Easting diet of fruits, vegetables, beans, whole grains, nuts, seeds, and low red meat
  - Maintain healthy weight (less than 30 BMI)

Results

- 93% Reduction in diabetes
- 81% Reduction in heart attacks (MI)
- 50% Fewer strokes
- 36% Fewer cancers
Dr Fergus Shanahan at the University College Cork (2018) in “Gut”

Compared microbiome of 40 male, professional Rugby players with 46 matched controls

Of 19,300 pathways that were examined – 98 were significantly altered toward potential health benefits

Better synthesis of carbohydrates and antibiotics

Higher levels of probiotic bacterium (Inversely related to both obesity and metabolic syndromes)

More short chain fatty acid metabolites related to leaner body type as well as a positive impact on colon health, enhanced immunity, and optimal brain function
“I blame my weight on bad genetics. I was born with a mouth and a stomach.”
Protective Caps

- Without telomerase, chromosomes fray over time and cells eventually stop dividing.
Telomere Length & Long-term Endurance Exercise Affects on Biological Aging

Telomeres are potential markers of cellular age
They are associated with physical aging

Test Groups

- 10 men (22-27 yrs) and 10 men (66-77 yrs)
- 5 Cross Country Birkenbeiner Racers + 5 Recreationally active participants from each group

Results

1. Older athletes had longer telomere length compared with older recreational
2. Younger athletes telomere length was not different from young non-athletes
3. Among the athletes there was a strong correlation b/n VO2 max and Telomeres
4. Corresponding association among non-athletes was relatively weak

Long-term endurance exercise training may provide a protective effect on telomere length in the older people

REF: Journals.plos.org; Osthus, Nauman et al; 2012
Lifestyle Changes May Lengthen Telomeres

A small UCSF pilot study shows for the first time that changes in diet, exercise, stress management and social support can result in longer telomeres, the parts of chromosomes that affect aging.

Here are some lifestyle changes undertaken by study participants:

Diet:
High in whole foods, plant-based protein, fruits, vegetables; Low in fat (10% of calories) and refined carbohydrates

Exercise:
Moderate aerobic exercise – walking 30 minutes per day for six days a week

Stress Management:
Gentle, yoga-based stretching or meditation for 60 minutes daily

Increased Social Support:
Weekly support group sessions that include moderate exercise, stress management training and counseling

Telomere TLC:
Healthy Aging Begins with Protecting Your Telomeres

Slow Telomere Shortening
✓ Meditate
✓ Eat a healthy diet
  • Omega-3 fatty acids
  • Antioxidants
  • Vitamin D
✓ Wear Sunscreen
✓ Exercise
✓ Be Happy

Speed Telomere Shortening
• Obesity
• Psychological Stress
• UV Radiation
• Smoking
• Pollution/toxins
• Lifestyle Diseases
• Oxidative stress
First Age Reversal in a Mammal

Telomerase reactivation reverse tissue degeneration in aged telomerase-deficient mice

- Telomerase Activation was used to change old mice to young adults
- Brain, spleen and reproductive organs were all rejuvenated;
- Resulting in increased neurons and new viable sperm cells
- Sense of smell returned
- None of the mice developed cancer

REF: 2011 DePinho et al
MEDITATION and EPIGENETICS

Numerous studies indicating positive impact on epigenetics biomarkers

- A 2008 study by Benson and Liberman at Harvard Medical School analyzed 22,000 genes and found changes in genes that upregulate energy metabolism as well as suppression of NF-κB which plays a role in inflammation, stress, trauma, and cancer.

- Replicated this study in 2013 with 26 long time practitioners of the relaxation response after a single 20 minute practice session compared to 26 who had never used that technique. Outcomes documented positive epigenetic changes in immune function, energy metabolism, insulin secretion, mitochondrial activation, and repair of telomeres.

- At the UCSF School of Medicine a 2008 study focused on prostate cancer. Participants were 31 men with a low risk form of prostate cancer who elected to decline immediate surgery, hormonal therapy, or radiation. Intervention was a three month program of a low fat, plant based diet and stress management. At the end of the 3 month intervention, these practices had decreased the expression of the genes associated with prostate cancer.
"What day is it?" asked Pooh.  
"It's today." squeaked Piglet.  
"My favorite day." said Pooh.
TRANSGENERATIONAL EPIGENETICS

- Three generation study of childhood obesity (May 2018)
- “Lifeways Cross Generational Cohort” of 1,094 children born to 1,082 mothers examined at ages 5 and 9 (N=589 Children)
- Data also available from 745 grandparents
- Maternal GRANDMOTHER waist circumference (WC) was predictive of grandchild WC at both ages
- This association NOT seen in maternal or male grandparental lineages

Reference: Pediatric Obesity - 9 May 2018
“We learned about genetics today, Dad. I inherited your eye and hair color. I also inherited your memories of Wild Susie and the summer of ‘68!”
EPIGENETICS of “Hangry”

- 23andMe surveyed more than 100,000 people asking:
  - “How often do you feel angry or irritable when you are hungry?”
  - Cross referenced responses with genetic data with 75% indicating this as a familiar mood
  - Expected genetic link to metabolism of sugar affecting mood
  - HOWEVER … data indicated two epigenetic links of “vaccinia-related-kinase 2” and “exoribonuclease 1” which are linked with neuropsychiatric conditions of depression and schizophrenia
  - More women than men reported “hangry” as well as both genders under age 50

REMEMBER THE TWENTY EXTRA YEARS YOU ADDED TO YOUR LIFE THROUGH CLEAN, HEALTHY LIVING? WELL, THESE ARE THEM.
• In 2018, Astronaut Scott Kelly set a record for the longest solo spaceflight in history at 340 straight days in space

• Researchers compared his genetic profile to his identical twin (Mark) who is also a NASA astronaut but remained on Earth during those 340 days

• During that time in space, Scott manifested “space genes” which were changed in their expression including his immune system, DNA repair, bone formation, hypoxia, telomeres had increased in length, and he had increased in height by over 2 inches

• Shorty after his return his height changed back to normal and 93% of his DNA expression normalized

• However … that means that 7% of his gene expression remained changed and “may remain that way permanently”

• In posting a Twitter, Scott quipped: “What? My DNA changed by 7%! Who knew? This could be good news! I no longer have to call Scott my identical twin brother anymore.”

O Master, is it proper for a monk to use email?

Sure... as long as there are no attachments!
System Summary

Foundation 1
Ingestion Sensor

What it identifies
• That a specific pill, tablet or other ingested product (or combination) was ingested.
• Composed and powered entirely from materials found in the daily diet.

Foundation 2
Wearable Sensor

What it identifies
• Precise time & identity of ingestions.
• Certain physiologic responses and consumer behaviors over time.
  – HR, HRV, activity, sleep, temperature.
• Acts as communications hub between ingested product and phone.

Foundation 3
Mobile Applications

What it influences
• Consumer reported wellness metrics.
• Correlations between ingestion adherence, patch physiologic measures, and data from other telemetric devices.
• Enable collaboration with clinicians and caregivers.
Tracking Adherence Enables Clinicians to Identify Patients Who Need Help

**Good Adherer**
A patient who takes pills at the same time everyday. No Intervention needed.

**Consistent daily dosing**

**Poor Adherer**
A patient who skips pills some days and has inconsistent dosing time. Reminders or other interventions may be beneficial.

**Missed dose**

**Inconsistent dosing - amount and time**
ACCESSIBLE, SIMPLE BLOOD COLLECTION, ANYWHERE

Virtually painless
No big needles
Simple to use
Can be self-administered

No cold chain required
Ease of shipping
Anywhere, Anytime Sampling
“First, we’ll need a sample of your DNA.”
“Divine Dozen” – Longevity Factors

• Mediterranean Diet – Fish but little or no red meat or poultry
• Smoking – Non processed tobacco products and no inhalation
• Physical Activity – Daily farming and/or fishing not in a gym
• Strong Psychosocial Bonds – No person is an island
• Old Age is Respected – Head of the family and makes major decisions
• Sexually Active – Touching, hugging, and intercourse into 80s and 90s
“Divine Dozen” – Longevity Factors

• No Fear of Death – Disability and “being a burden” is an issue
• Alcohol consumption – More than “moderate” but with meals
• Sound/Clean/”Organic” Environment – Little to no pollution/toxins
• Appropriate Primary Medical Care – Includes “alternative” therapies
• Genetic and Epigenetic Influences – Lifestyle and gene interacting
• Meditation/Prayer/Introspection – Have a philosophy of life = Wisdom
I got one of those DNA kits. Turns out I'm 85% water, 8% dirt and 7% dog pee.
Epigenetics – What is Known

- Tripartate Assay: Genetic, Blood (CBC), and Microbiome
- Genes predict probabilities not certainties
- Biomarkers of health not disease prediction
- Monogenic - Applications of single gene = single disease is very limited
- Genes work within complex genetic and environmental matrices
- Human base is @ 21,000 genes – DNA for protein coding is only 5% of this entire genome = “Dark Genome”
- Genes are turned on or off like a rheostat
- Gene expression changes – What we do matters!
- Majority of genes governed by beliefs and lifestyle choices
- Neanderthal genes are alive and well – Stress Responses
If you are depressed, you are living in the past.
If you are anxious, you are living in the future.
If you are at peace, you are living in the present.
thank you

www.drpelletier.com
That's all for now folks!