Becoming an Epigenetic Nutritionist

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- **Bastyr University, 1982: Pizzorno, Bland, Bastyr, Gaby, Wright, Mitchell, Carrol, Madison.**
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  www.PureWellnessCenters.com
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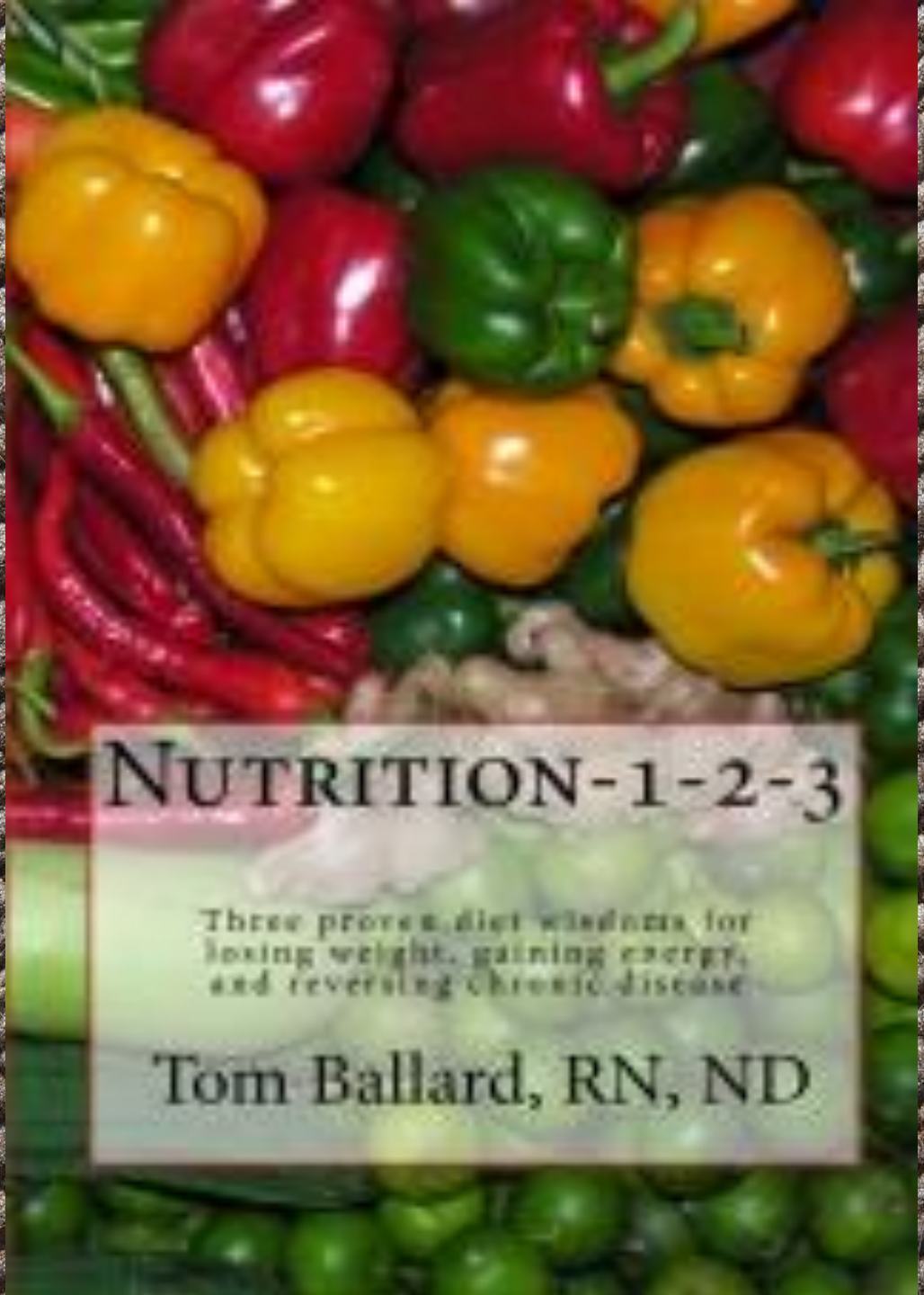
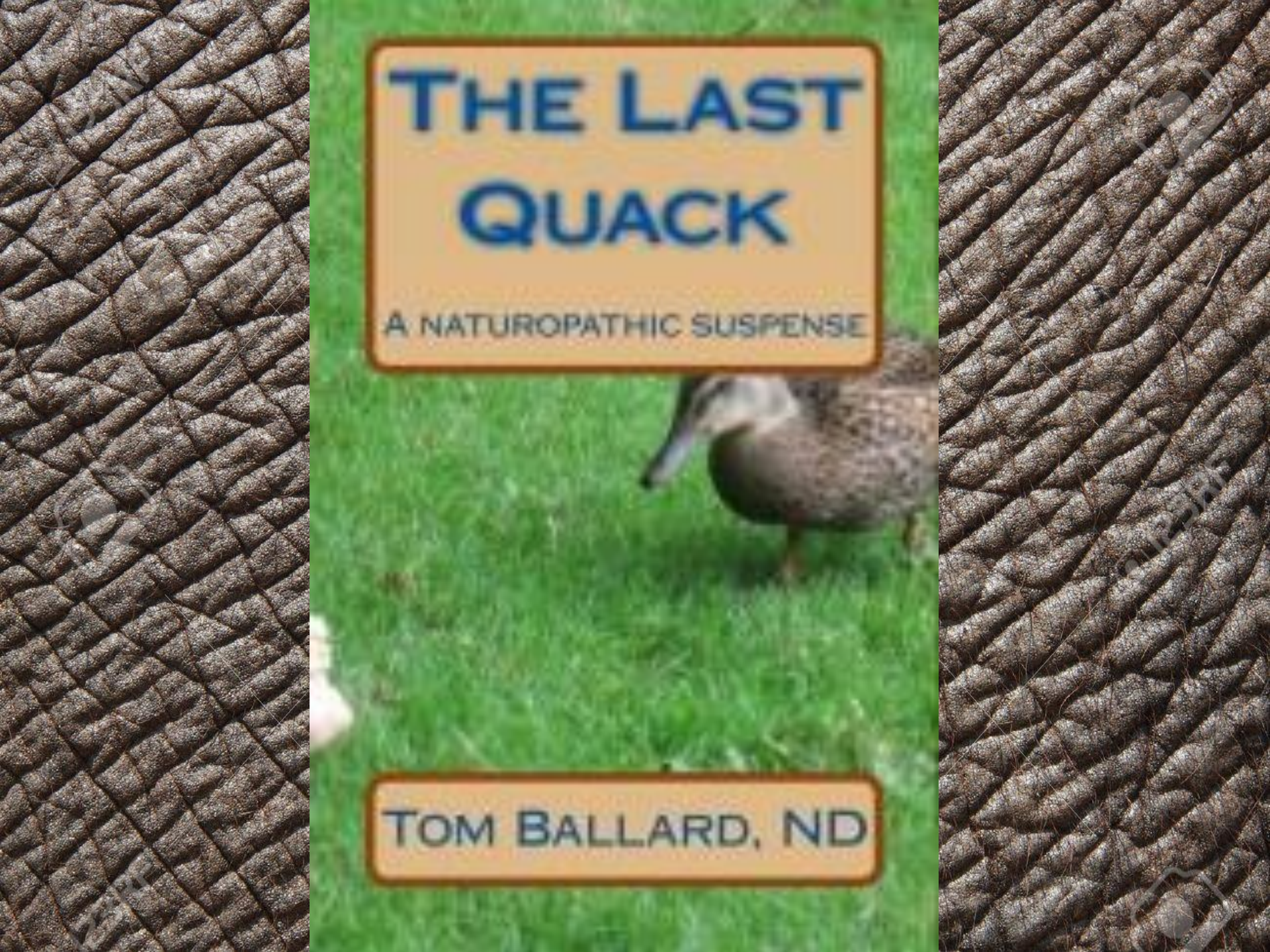
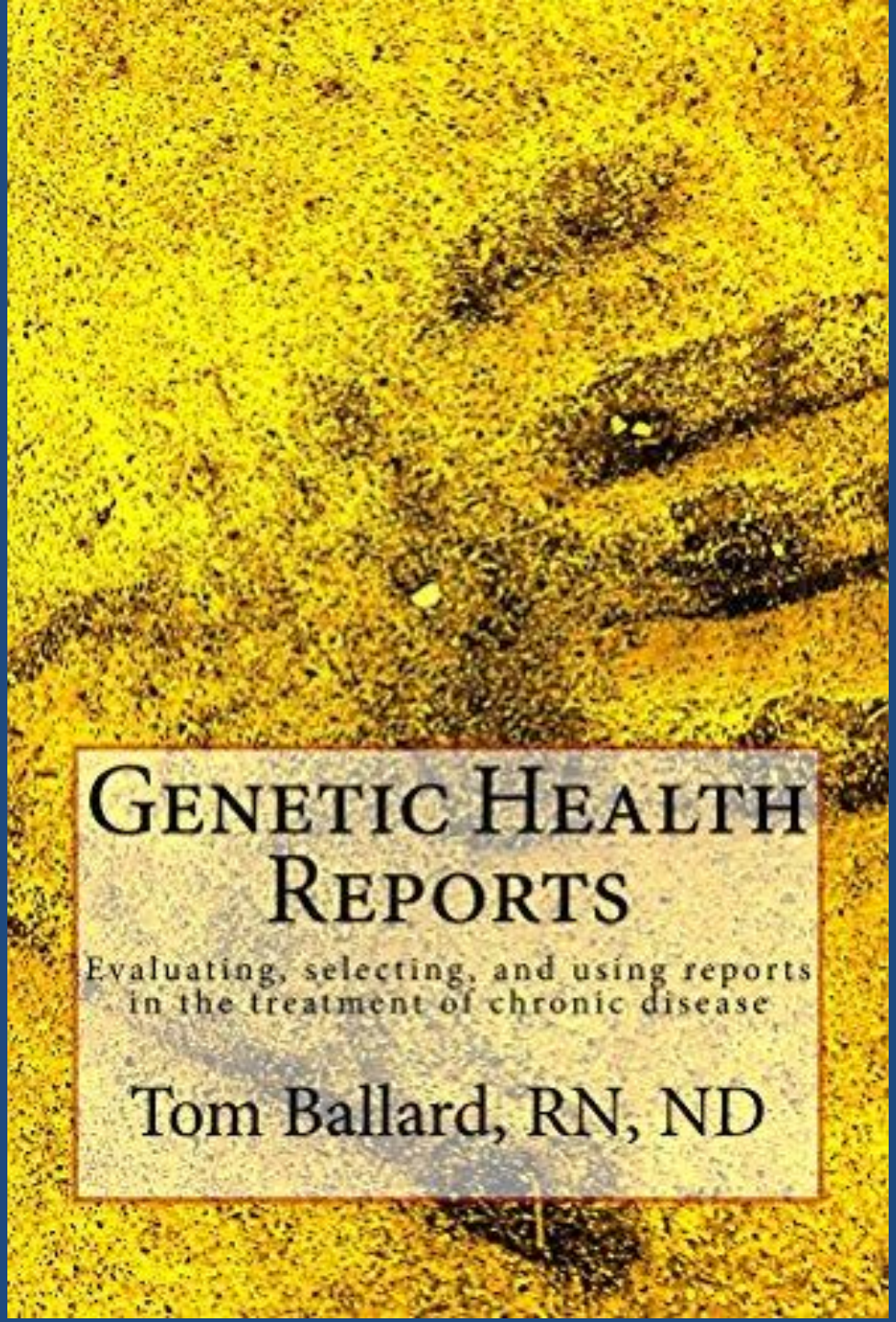
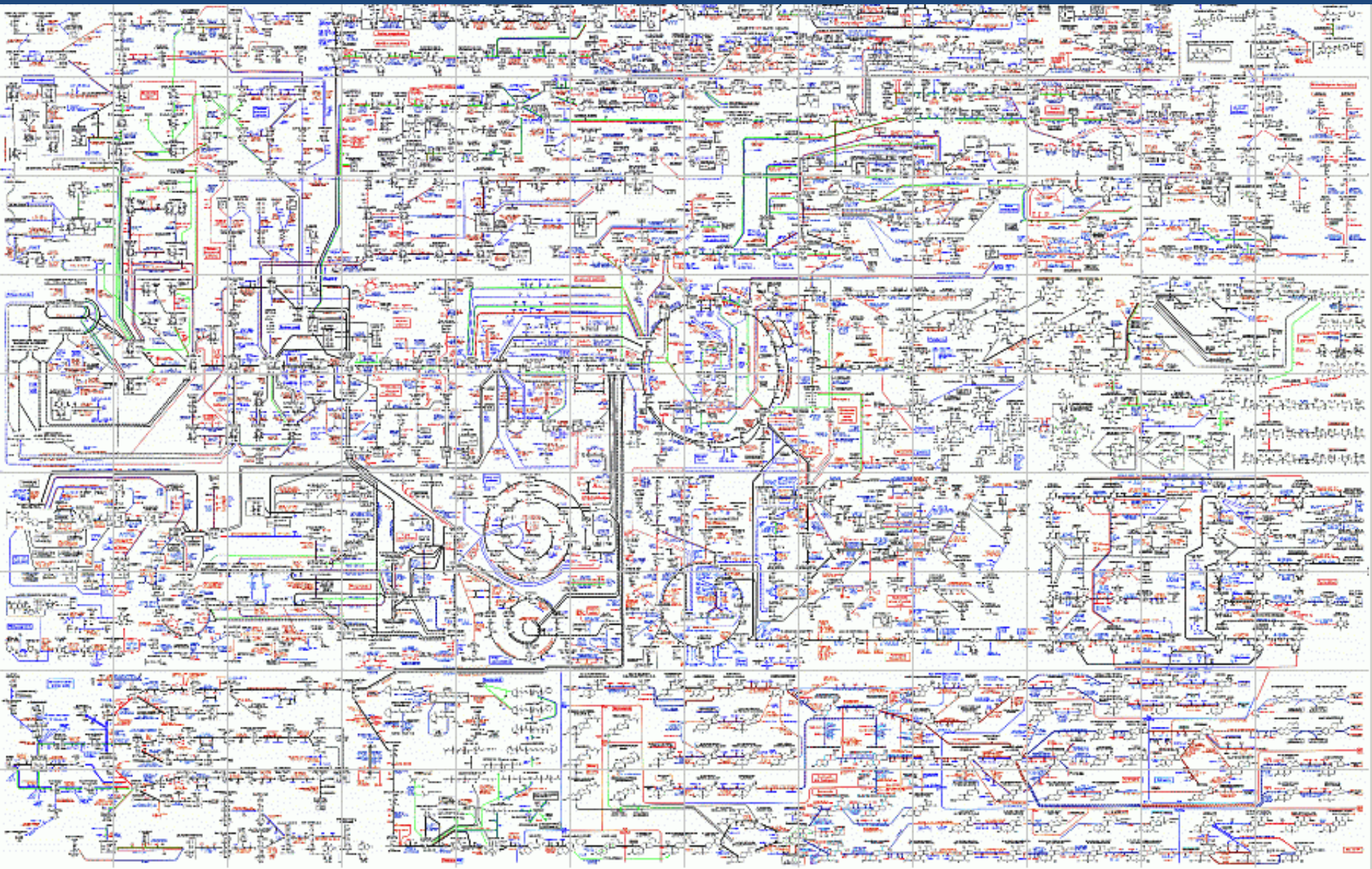
  www.NaturalDNASolutions.com


NUTRITION-1-2-3
Three proven diet wisdoms for losing weight, gaining energy, and reversing chronic disease
Tom Ballard, RN, ND


THE LAST QUACK
A NATUROPATHIC SUSPENSE
TOM BALLARD, ND


Genetic Health Reports
Evaluating, selecting, and using reports in the treatment of chronic disease
Tom Ballard, RN, ND

Learning Objective



Learning Objectives

1. Enable you to become an epigenetic practitioner by:
    1. Familiarize practitioners with the importance of genetics for personalizing health care.
    2. Overcome the perception that there is a “steep learning curve” that must be overcome before genetics can be utilized in the clinic setting. Choice of genetic health report solves this challenge.
    3. Understand the importance and types of genetic health reports that are available.
    4. Learn the types of patients who benefit from genetic health reports.
    5. Review patient appointment scenarios.

The Revolution is Happening

- Still riding a horse, using whale oil?
- Vitamin X is good for Y disease
- Mineral A is good for B disease
- Your patients know this.

Genetic medicine is here

- Medicine has entered the 'genome era.'[1]
- Genetic medicine is helping practitioners and patients identify and successfully treat chronic health conditions.[2, 3].
- "Recent developments in genomic sequencing technologies have the potential to revolutionize the diagnosis and treatment of many diseases…".4

If not; why not?

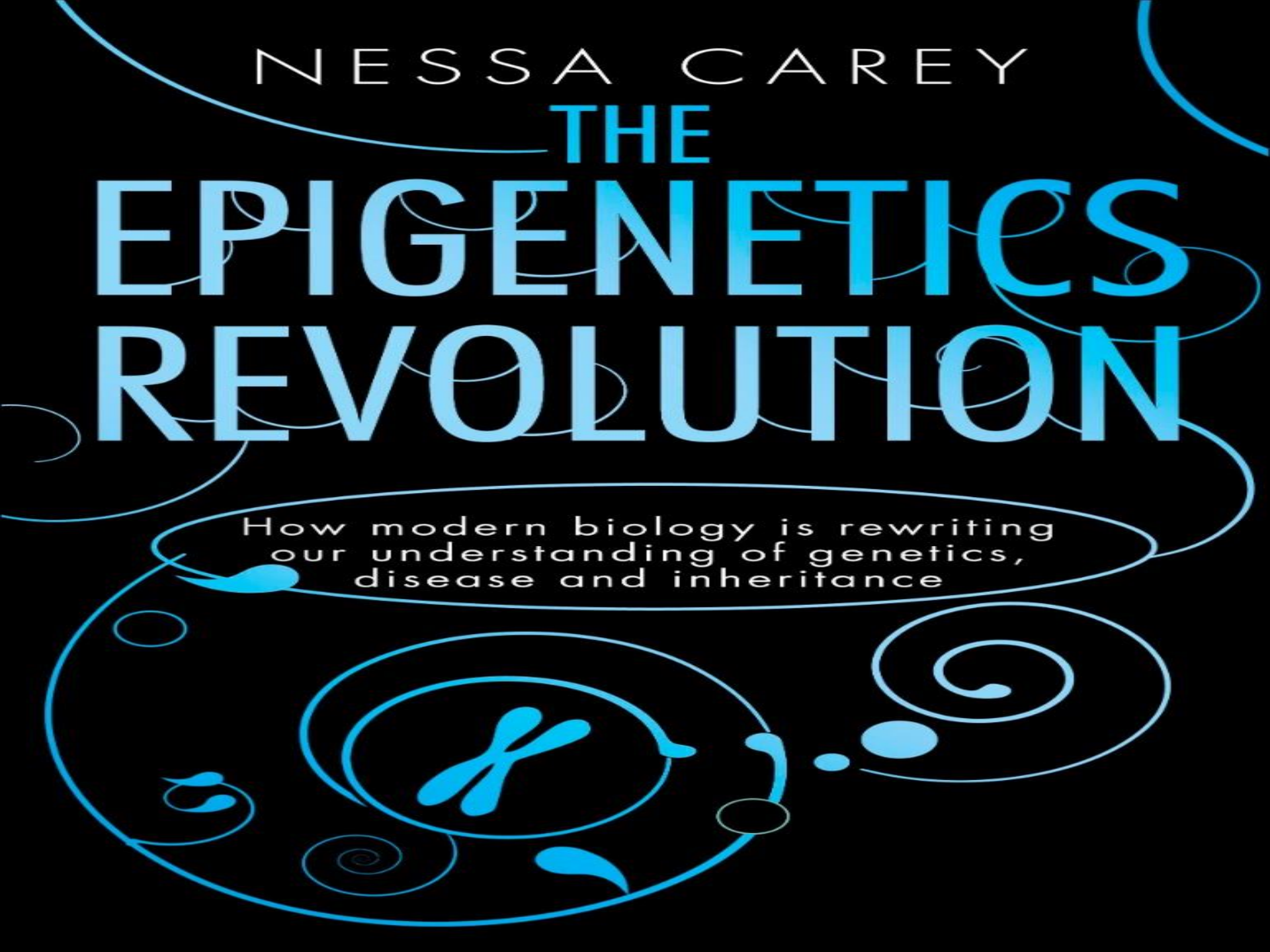
- “The majority of health professionals lack confidence in accurately interpreting…”3

- “Sometimes the greatest scientific breakthroughs happen because someone ignores the prevailing pessimism.”
  - Nessa Carey, The Epigenetics Revolution: How Modern Biology is Rewriting our Understanding of Genetics, Disease and Inheritance

NESSA CAREY

THE EPIGENETICS REVOLUTION

How modern biology is rewriting our understanding of genetics, disease and inheritance



Personalized Medicine

- William Osler, MD, the founder of Johns Hopkins Hospital and the "Father of modern Medicine", said:

- *"The good physician treats the disease; the great physician treats the patient who has the disease."*

The Human Genome Project Births a New Science: Epigenetics

- The age-old Nature vs. Nurture paradigm has been settled.

- We're a 50/50 balance. (Some researchers believe we're actually a 49/51 split, in favor of nurture.)

The epigenetic epicenter of shift

- Osler and Bastyr: enduring (if often overlooked) quotes*:*

- *"Listen to your patient. He is telling you the diagnosis."*

- Osler, as a superb diagnostician, would also be listening at the very deepest level: genetics.

Genetics/Epigenetics demonstrates the importance of?

- Detoxification
- Nutrition
- Vitamins
- Minerals
- Activity
- Bedtime stories

Naturopathic Proof

- Genetics proves that Naturopathic medicine - whole-system nurturing - is founded on science, further supporting research findings.

- Genetics guides us to the best, most individualized, support strategies.

The New Yorker: Same But Different

5/2/16

Interview of the scientists who discovered epigenetics

**Epigenetic message is passed on.

- Dr. David Allis: **“…manipulating genes has turned out to be much harder than envisioned.”**
  - Gene splicing
  - Drugs

Introduced Goats Destroying Olympic Rainforest

We are the Gene Whisperers

- What do our genes “need”? Ie How can we “nurture” them?
- What helps the gene/enzyme function optimally?
- The code behind the biochemistry that naturopathic medicine nurtures.

Listening to diamine oxidase gene (DAO)

- DAO FUNCTION: Break down histamine.
- DAO SUPPORT/NURTURING
  - Detoxification:
    - Excess histamine intake or gut production.
  - Nutrition:
    - Coenzyme is vitamin B6 (provides the enzyme/substrate fit) (Bruce Ames)
    - Reduce high-histamine foods.
  - Activity:
    - Reduce stress, as it increases histamine.

The lesson of “listening” - DAO gene

- Guide to therapy
  - Detoxify:
    - Reduce endogenous and exogenous toxins (histamine)
  - Nutrition:
    - Cofactor and food choices.
  - Activity:
    - Stress reduction
    - Hormone and neurotransmitter modulation.

New Paradigm

- We are no longer in the world of asking, “Is X good for Y condition?”
- We’re now in the world of, “Is X good for this individual?” ie What will support this specific person’s health?
- (May be good for 70%, indifferent for 15%, and bad for 15%)
- Example: Coffee

Epigenetic therapy organization (Whispering of Genes)

- Detoxification:
  - There are more genes coding for detoxification enzymes than any other process.
- Nutrition:
  - Genes/Enzymes dependent on the intake/production of nutritional elements.
- Activity:
  - Change gene expression as reflected in chemistry, MRIs, and mood.

Epigenetic Treatments: *DNA* for DNA

- **D**etoxification: turns off “bad” genes.
- **N**utrition: Healthy foods turn on “good” genes
- **A**ctivity (mental & physical): turn off “bad” genes and turn on “good” genes

Epigenetic Practitioner – Why?

- It's the deepest level of listening to the body.
- Patients are asking for it.
- If we don't promote modulation medicine , then manipulation medicine will go unchallenged.

Practice building

- Discussion groups on genetics or complex/chronic disease
- Articles “I had my genes tested and all I got was this T-shirt.”
- Millions of frustrated genetic testers
- Lots of media coverage -> Frustration with docs not providing this service.

Epigenetic Practitioner – Who?

- Naturopathic doctors, Functional Medicine, whole-system practitioners.
  - Respect of physiology/biochemistry
  - Already know the *DNA therapies*
  - Take seriously our role as teachers

Epigenetic Practitioner – How?

- Upgrade your understanding of genetics
  - General
  - Specific vocabulary
- Restructure appointments to accommodate genetics
- Develop new handouts
- Promote

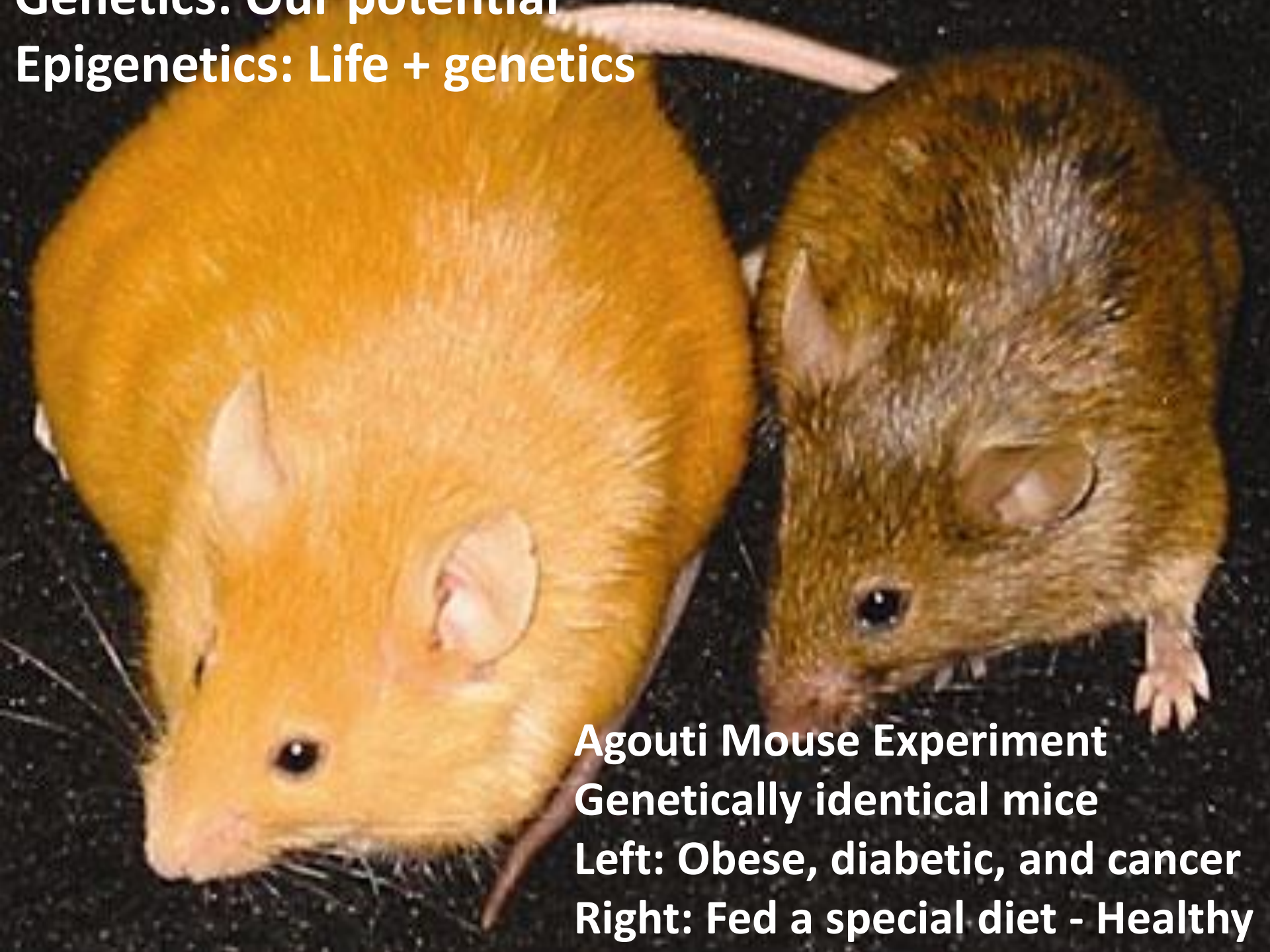
Genetic learning curve

- Not as steep as often feared
- We already have:
  - Basic genetics
  - Epigenetic knowledge (heredity isn't fate!)
  - Fundamentals of biochemistry (Gene>Enzyme/cofactor)
  - We know and have experience with *DNA* treatments. (ie Nutrition changes genetic expression)

Becoming an Epigenetic Practitioner

- Leveling the learning curve:
  - An understanding of genetics and epigenetics
  - Vocabulary
    - Genome, DNA, gene, allele, SNP, base pairs, histone, epigenetics, amino acid, protein, methylation, folic acid, folate, MTHF, MTHFR, trans-Sulfuration, COMT, mitochondria, enzyme, coenzyme, and cofactor.
  - Genetic health report:
    - Tool for understanding, organizing, teaching, and researching.

Genetics: Our potential
Epigenetics: Life + genetics



Agouti Mouse Experiment
Genetically identical mice
Left: Obese, diabetic, and cancer
Right: Fed a special diet - Healthy

What's the best DNA test/report?

- General Features
  - Accredited lab.
  - Years in business.
  - Large number of researched gene variations.
  - Organized in functional categories (see below)
  - Searchable by condition/system.
  - Affordability. Prices currently vary from a donation to thousands of dollars.

Creatinine is approximately 13% higher for people identified as African-American.

eGFR	100	>=60 mL/min/1
eGFR AFRICAN AMERICAN	116	>=60 mL/min/1
GLUCOSE	82	65-99 mg/dL
CALCIUM, SERUM	9.3	8.6-10.3 mg/
PROTEIN, TOTAL	7.1	6.2-8.3 g/dL
ALBUMIN	4.7	3.6-5.1 g/dL
GLOBULIN, TOTAL	2.4	2.1-3.7 g/dL
A/G RATIO	2.0	1.0-2.1 rati
AST (SGOT)	24	10-40 U/L
BILIRUBIN, TOTAL	0.5	0.2-1.2 mg/d
ALT (SGPT)	46	9-60 U/L
ALKALINE PHOSPHATASE	53	40-115 U/L

MTHFR DNA MUTATION
METHYLENETETRAHYDROFOL
REDUCTASE (MTHFR)
DNA MUTATION ~~ANALYSIS~~ SEE BELOW

RESULT:
POSITIVE FOR TWO COPIES OF THE C677T MUTATION

INTERPRETATION:
This individual is homozygous for the C677T mutation and negative (normal) for the A1298C mutation in the MTHFR gene. This genotype occurs in 1.5-15% of the population and is associated with increased plasma homocysteine levels, a risk factor for arteriosclerotic

Report cautions

- Supplement prescribing
- Disease prediction
- Not enough genes reported

Organization: Functional Categories

- Liver Detox - Phase I & II
- Yeast/Alcohol Metabolism
- Methylation
- Trans-sulfuration/Glutathione pathway
- Neurotransmitters 1: Serotonin & Dopamine
- Neurotransmitters 2: Glutamate & GABA

Functional Category (2)

- COMT/MAO Activity
- Mitochondrial Function
- Alzheimer's
- Cardio/Lipid
- IgG
- IgA
- IgE
- Clotting Factors
- Celiac Disease/Gluten Intolerance
- Thyroid
- Eye Health
- Other Immune Factors
- Pentose Pathway
- Oxalates
- Exercise

Comprehensive Genetic Health Report

- List of genes tested
- Gene function
- Disease tendency (not prediction)
- Organization by functional category
- Prioritization
- Guidance on further testing/monitoring
- Treatment options

Comprehensive Report Example - Function

- “The GAD gene codes for the GAD enzyme that converts glutamate (an amino acid) to GABA (a neurotransmitter). Glutamate is neuro-excitatory (stimulating), while GABA is relaxing. Our bodies depend on a balance of these.” Etc.

Comprehensive Report Example – GAD

- Disease association
  - "A high glutamate to GABA ratio is associated with agitation, insomnia…(etc)"
- Testing
  - Glutamine
  - Glutamate
  - GABA
  - Reaction to glutamate foods/MSG
  - Etc
- Treatment
  - Avoid foods high in glutamate. These include…(etc)

Types of testing/reports

- Do it yourself:
  - From raw data
- All-in-one:
  - Tests the genes and provide a report
- Third-party:
  - Generate reports from raw data providers

PLEASE READ WEBSITE CAREFULLY

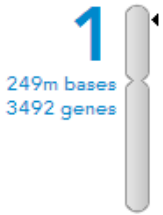
- Testing/Report: the industry changes quickly!

Do it yourself analysis

- Step one: collect genetic data
- Step two: Analysis
  - SNPedia
  - Wikipedia
  - Genome.gov
  - Genecards.org

BROWSE RAW DATA

Your data includes 59 SNPs on gene MTHFR, which is on chromosome 1.



Jump to a gene: MTHFR Go a SNP: Go

or a chromosome:

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 X Y MT

« Return to your whole genome.

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Gene	Position	SNP	Versions	Thomas Ballard, RN, ND's Genotype
LOC100506310, MTHFR	11846198	rs15854	A or G	AA
LOC100506310, MTHFR	11846252	rs4846048	A or G	AA
LOC100506310, MTHFR	11846270	rs1057624	C or T	TT
LOC100506310, MTHFR	11846447	rs4845884	A or G	AA
LOC100506310, MTHFR	11847436	rs2184226	C or T	TT
LOC100506310, MTHFR	11847449	rs3737967	A or G	AG
LOC100506310, MTHFR	11847742	rs28484963	G or T	TT
LOC100506310, MTHFR	11847759	rs3737966	C or T	CT
LOC100506310, MTHFR	11847861	rs1537516	A or G	*no call*
LOC100506310, MTHFR	11847902	rs1537515	A or C	AC
LOC100506310, MTHFR	11848054	rs34733339	C or T	TT
LOC100506310, MTHFR	11848879	rs2077360	A or G	GG
LOC100506310, MTHFR	11849447	rs868014	A or G	GG
MTHFR	11850365	rs4846049	G or T	GT
MTHFR	11850750	rs35737219	A or G	GG
MTHFR	11850927	rs2274976	C or T	CT
MTHFR	11851118	rs7518348	A or G	GG
MTHFR	11851273	rs45590836	C or T	CC

YouTube: Tom Ballard ND

Do-it-yourself Issues

- Labor-intensive.
  - You must know or look up the SNPs one at a time
  - Understand and translate a complex explanation of gene function
  - Organize genes into functional categories.
  - Supply information on further lab testing
  - Prioritize
  - Suggest treatment options

All-in-one reports

- Both the genetic lab testing and a report/analysis
  - Type:
    - Focused
      - Weight, fitness, mental?
    - Comprehensive
      - Whole system
  - Other factors: Number of genes, supplements, testing, prioritization, treatments, price.

Third-party report providers

- Translate raw data into a report
- Two step process:
  - Raw data: 4-6 weeks. $100-200
  - Report: 5 min to -10 days. $0 - $6000
  - Content
    - Varies from simple report with few genes to comprehensive with 1000s of genes.
    - Some offer nursing consults, meal delivery, etc, etc.

Service	Number of genes examined	Gene categories	Gene function described	Treatment options provided	$
Natural DNA Solutions	1400	18	Yes	Detailed options including lab testing, lifestyle, nutrition, and detoxification	$149
23andme.com & Ancestry.com	Thousands. Changes.	NA	No	Raw data. Limited data on genetic diseases.	$99 - $199
GenePlanet	?	?	No	% chance of disease	499 British Pounds
GenOMind	8	1	Yes	Drug-based from doctor	? Out of pocket after Insurance
Livewello	200	13	Yes	No	$19.95
MTHFSupport	1400	18	No	No	$30
Genetic Genie	58	2	No	No	Donation
Nutrahacker	195	2	No	Limited	$37
HeartFixer	1400	18	By consultation only	Yes	$553
NutraSync	28	1	Yes	Nutrition & Supplements	$250
Dr.Amy Yasko	30	1	Yes	Yes. Her products. Autism focus	$495
Strategene	28	Several	Yes	Yes	$45
HealthCoach7	600		Yes	Recommends their supplements	$400

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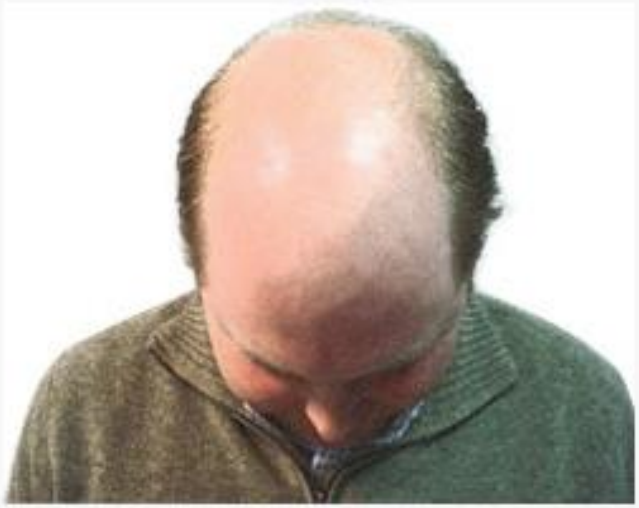

Bad	Repute
3.1	Magnitude
20141110	Geno time

7x risk of baldness 7x risk of baldness according to an article in Nature. That site may require paid access; the abstract at is accessible.

Topics Forensically Useful Morphological Traits

Medical Conditions Baldness

gs237

3.1	Magnitude
20140331	Geno time

Genetic health reports in the clinic

- Types of genetic appointments

1. The patient with an existing genetic information
2. The patient without genetic information

Patients with existing genetic information

1. Raw data only
   - Patients usually don't understand what they have.
   - Explain the need to convert data into a report

2. Existing report
   - Bring it to you because they don't understand.
   - May or may not be robust
   - Provides a starting point
   - May need to order a more comprehensive report

Fee-for-services package

- Send their data to a third-party report provider or an all-in-one service

- Package example:
  - Initial consult
  - Report of findings and hard copy
  - One or two follow-up appointments (with lab and homework assignments (diet/symptom diary))
- Strength: Understandable, best use of your time, marketable.

Focused or Comprehensive Clinic Packages?

- Methylation/detoxification
- Mental/emotional
- Exercise
- Weight loss
- Comprehensive
  - My experience is that while limited genetic testing sometimes hits the mark, it is fraught with problems and often the patient ends up needing the more comprehensive report anyway.

- Lab testing not part of package.

Hourly consultation

- More open-ended
- Allows them to bring their own data/report

Insurance coverage

- Unlikely to cover more than MTHFR testing
- If insurance covers you, it is for your time/service, not for the testing.

Patient with a genetic health report

- Type of report vary widely
- MTHFR is most common (Folate/methylation)
- First steps are the same
  - Education: Nature/Nurture (Rat Photo)
  - Personalization:
    - History
    - Physical
    - Labs

Personalization: Laboratory testing

- Confirmatory:
  - Iron
  - Stool – celiac, bile
  - Oxidation
  - Hormones/neurotransmitters
  - Bleeding
  - Thyroid antibodies
  - Organic acids
  - Methylation
    - Methionine
    - Homocysteine
    - SAM

Patients without genetic information

- Deciding to genetic test a patient
  - Types of patients
    1. The health enthusiast.
    2. The patient with a poor family history – *"What can I do to not get ___"*
    3. Patients who are challenging because they:
       - Difficult to diagnosis
       - Don't respond to treatments
       - React idiosyncratically to treatments.

The challenging patient

- Difficult to diagnose
  - Comprehensive health history
  - Physical exam
  - Stay “Patient focused” rather than “problem focused”. Just because they don’t fit into neat category doesn’t mean they’re not sick.

Difficult Diagnosis: Example

- Example: Estrogen dominance
- You may recognize the signs and symptoms, but "Why?"
  - Too much produced?
  - Too much taken?
  - Low levels of other hormones? (Relative increase)
  - Not enough removed (CYP & COMT – Detox)

Not responding to treatments

- The “right” treatment not working.

- Genetics can take you past the old “Treatment x is good for disease y” paradigm to the genetic-era approach of “Which treatment is good for this specific patient?”

Idiosyncratic reaction to treatments

- Non-allergic food/supplement reactions
- Methyl groups (COMT & MAO)
- Polyphenols (catechols) (COMT, SULT)
- Trans-sulfuration
- DAO/histamine
- GAD/glutamate

The DAO Generalized Allergy

- DAO breaks down histamine in the gut.
  - Not enough DAO enzyme for the amount of histamine coming in
    - RX:
      - 1. Reduce histamine foods (fermented, + dozens of others)
      - 2. Prescribe DAO enzyme

Epigenetic Appointment

- Epigenetic-focused, cash practice or insurance
  - Avoid losing the forest for the trees. Focus on patient.
    - H&P
  - Pace your presentation to accommodate your patients' understanding of genetics.
  - Provide written material. (May come with the genetic health report)

The patient with insurance

- The method of payment can determines how appointments unfold.
- You can treat the individual either way but the distribution of appointment will be different.
- Insurance is more likely to limit appointments in time but not the number of appointments.

Breakdown of appointment content

- First appointment, new patient w/o report
  - Groundwork: Hx/Phy
  - No genetic testing/report.
    - The process takes time, so start now (3-8 weeks)
      - Education: Epigenetics/Insurance won't pay.
      - Report recommendation/pricing/sample
      - Kit or contact.

Patient with raw data

(23andme most common)

- Often come in with high level of frustration, fear, and questions that they want answered pronto
  - Education: Nature/Nurture
  - Treating patient not genes (SNPs)
  - Discuss the advantages of turning their raw data into a report.
  - Have a recommendation/sample in mind.

Patient with genetic report

- Make a copy of their report
- Let them know you understand.
- Nature/Nurture education
- Why did they have genetic test and what symptoms they're having that they believe relate to genes.
- Also ask if they've already tried a treatment, what that was, and what happened.
- Common is MTHFR and didn't respond to Rx.
- Danger: Losing patient focus, treating the gene (SNP)

Second appointment with report

- To history and physical, add homework and labs.
- If brought genetic report to first appointment, you've had time to study it.
  - ***Your key task is correlating their genetics with their health issues – Personalization.*
  - *Some reports will help you with this*

Second Appointment: No report

- Check on progress and proceed as you normally would.
- I keep a spreadsheet on patients with points that I want to follow over time. These include:
  - Weight, percent fat, muscle, water.
  - Energy rating 1-10.
  - Blood pressure, pulse.
  - Symptom rating 1-10 (i.e. Asthma symptoms, headaches, etc)
  - Physical signs. (Swollen glands, abdominal tenderness, etc.)

Prioritizing health challenges

- Ask the patient and then listen
  - "I'm tired all day and then can't sleep at night. Oh, and my BP is high."
- Then use clinical judgment
  - Life threatening
  - Chronic/recurrent infections often not reported.
  - Digestion (even if they don't mention it)

Presenting the Report

- General points:
  - We all have a lot of gene variations.
  - Gene variations (SNPs) are what make us unique.
  - All gene variations are not “bad”. They have a survival function.
  - The most important ones are those that correlate with your health history. (ie BP)

Narrowing genetic suspects

- Energy problem:
  - Thyroid, Mitochondria, and Methylation are obvious places to start.
- Non-allergic food reactions:
  - DAO, GAD, SULT, COMT, MAO.
- Mood:
  - Neurotransmitters, MAO, COMT.
- Toxicity
  - CYP, PON, SULT (Glutathione), SOD, etc

Searchable reports

- Search by health concern

- Category search
  - Do they have a functional categories with a lot of SNPs?

The “usual suspect” in the genetic dragnet

- The low-hanging fruit is methylation.
- Methylation complicated by
  - Dirty genes
  - COMT/MAO
  - Nutrient deficiencies
  - Stress

Dirty Genes

- Remember, you can have “good” genes that behave badly when toxic or undernourished

- Dirty genes are the monkywrench that complicates diagnoses and treatment and reminds you that your treating the patient, not the genes.

Third appointments and beyond

- Data gathering complete.
- Response to early interventions noted.
  - (As you know, you've often fixed much of the "low hanging fruit."
    - (Exp: Pt wanting AA testing)

Epigenetic treatments

- Organize by: Detoxification, Nutrition, and Activity.
- Based on Hx/PE

Epigenetic Appointment Example

- Mary. 49yo, schoolteacher
- CCs: Fatigue, weight gain, insomnia, rising BP.
- Many doctors and brings in a written history and copy of laboratory testing she's had in the past.

Mary's first appointment:

- HX/Physical
- Health issues priority
- Genetic testing discussion

Mary's Priorities

- BP: Potentially life-threatening
- Fatigue: Affects her ability to heal and compliance with treatments
  - Insomnia
- Weight will often take care of itself

These are all affected by genes.

Mary: Genetic: Yes, or No?

- Conditions not especially difficult to treat under normal circumstances
- She's proven to be
  - a challenging patient
    - Many doctors
    - Brings in a written history
    - Brings in years of lab results
- Discuss genetic option, sample, written material

Mary's Prescription: 1st Appointment

- Homework:
  - Diet/symptom diary
  - Bring in labs
  - Bring in supplements
  - Exercise as tolerated.
  - Daily morning temperature for seven days.
  - Compare home BP device to fire station and record daily BP at rest.
  - Begin genetic evaluation process.

Mary's Second Appointment:

- Finish any unfinished tasks from the first appointment such as a physical exam.
- Review of homework outcome
- Genetic testing proceeding?

Mary's Second Treatment plan

- Additional Lab testing if indicated.
- If digestive symptoms: digestive analysis/therapeutic trial.
- Supplement treatment (BP, insomnia, etc)
- Homework:
  - Continue monitoring blood pressure and diet/symptom diary.
  - **Proceed with genetic testing.**

Mary's Third Appointment

- Response to treatment.
- Lab update if needed.
- Review homework
- **Report of findings: Genetics**.
  - Focus on primary symptoms: BP, fatigue, insomnia
  - Copy/link to relevant material.
  - How does genetic information change the treatment?

Mary's Post-Genetic ROF

- Example MTHFR
  - Codes for enzyme converting folate to MTHF.
  - Wide-ranging effects (miscarriages, depression, CVD, etc).
  - Do these match her S/S?
  - Testing:
    - Folate/mthf
    - Methylation/homocysteine
- Any unrelated but potentially significant gene variations? (Ex: SNPs suggesting autoimmune which isn't showing)
    - FU monitoring/labs

Mary's Post-genetic Prescription

- Has her condition already been cured? (green leafy vegies, stress reduction?)
- **If No.**
  - Look at the gene through the lens of Detoxification, Nutrition, and Activity – the *DNA* treatments for DNA.

DNAing Mary's DNA

- D: Toxic load, digestion?
  - GI/toxin testing?
- N: Hates vegetables?
  - MTHF Supplement indicated
- A: Stress level?
  - Does her home or work life tax her methylation cycle, placing more burden on her folate supply?
- (Usually some of all three, though one often dominates)

Patient w/o genetic test: Dave

- Dave: First appointment
  - 40 yo Microsoft employee
  - CC: Anxiety, low libido. (Are they related?)
  - Education: Nature/Nurture
  - Personalization: (which SNPs manifesting?)
    - H&P
    - Labs

Dave's PE

- While he didn't list them, physical exam reveals…
  - Overweight
  - enlarged breasts.

Dave: Genetic testing or not?

- There are many avenues that predispose to anxiety and hormonal imbalance.

- Genetic testing will speed diagnosis and focus therapy.
  - Excess Estrogen: Too much in? Not enough out?
  - Low Testosterone: Not enough in? Too much out?

Dave's First Treatment Plan

- Request labs
- Bring supplements
- Diet/Symptom diary
- Exercise daily as tolerated (increase T)
- Timer stand every hour at work with flailing and shouting.
- Laboratory testing: Testosterone, estrogen, cholesterol, and liver function if they have not been done.
- Genetic testing.

Dave, appointment two and beyond

- While waiting for genetics:
  - Continue information gathering
  - Likely find poor exercise tolerance and low relative testosterone, at the very least.
    - Exercise, sleep, protein, fats, and other tx to increase testosterone.

Dave's Post Genetic Therapies

High estrogen:

- CYP, COMT, MAO for removing estrogen are down-regulated
  - Tx: Nurture these genes. (If you don't know, a good Genetic Health report will show you how)
  - Monitor progress

Without genetics: Barbara

- Barbara, 52-year-old hospital administrator.

- CCs: Fatigue, low thyroid, anxiety, poor sleep, depression, gas and bloating, frequent sinus infections.

Barbara: Genetics or Not?

- Many doctors
- 10 years
- Fluctuating thyroid (endocrinologist monitors/adjusting thyroid q 3 months, recommending removal, antibodies once years ago)
- Job demands high functioning

Barbara's Pre-Genetic Rx

- *DNA evaluation*
  - D:
    - Chronic sinus
    - Frequent antibiotics
    - Gut
  - N:
    - Chronic dieter due to weight – low intake of nutrients.
    - Goitrogens high
  - A:
    - Irregular activity.
    - High stress

Barbara's pre-genetic treatment

- D:
  - Daily saline sinus rinses with rotating herbal antiseptics
  - Bromelain/NAC to aid removal of mucus.
  - Air purifier
  - Diet/symptom diary particularly following mucus and sinus (rotation diet)
- N:
  - More protein
  - Fewer refined carbs.
  - Regularity/Variety/Whole
- A:
  - Daily outdoor activity such as walking for at least thirty minutes.
  - De-stressing activities

Barbara Labs:

- Order Genetic Health Report
- Spreadsheet labs (Thyroid, CBC)
- TPO/Anti-thyroglobulin along with other 3 month monitoring.

Barbara's Post Genetic

- Review: Already feeling better off dairy. No sinus congestion.

- In addition to Thyroid autoimmune genes.
  - BCMO: Vitamin A
  - Liver/gallbladder/Fat (EPA/DHA)
  - Tyrosine metabolism (one of few who respond to tyrosine)

Barbara's Post DNA Rx

- Continue earlier treatments.
- Stay off dairy and wheat.
- Repeat autoantibody testing.
- Vitamin A (not carotene)
- Fish oil
- A mixed herbal/nutrient liver detox support formula.
- Gut rebuilding
- (later discuss other potential gene issues (depression))

Genes & Pharmaceutical

CYP 1A2: Cytochrome P 450:
Phase I detoxification. Changes fat-soluble compounds into water-soluble for elimination by phase II enzymes.

Gene variations:
Associated with compromised detoxification and increased toxic load with widespread effects throughout the body. Poor removal of estrogen increases the risk of estrogen-associated cancers such as breast cancer.

1A2 acts to remove 5-10% of drugs in current use, including clozapine, imipramine, and paracetamol, theophylline, warfarin, tamoxifen, and several antidepressants.

Known to convert polycystic aromatic hydrocarbons from cigarette smoke to carcinogenic intermediates. Also metabolizes caffeine, aflatoxin B1, and acetaminophen.

CYP1A2 is induced by cabbage, cauliflower, broccoli, grilled meat, echinacea, insulin, and tobacco.

Genes & Pharmacy 2

CYP 2B6: Cytochrome P 450:
Phase I detoxification:
2B6: Gene variations cause down-regulation of metabolism of nicotine, xenobiotics.

Gene variations:
Over 100 variations of CYP2B6 have been found, making it one of the most polymorphic of the cytochrome p450 genes. This gene/enzyme is the primary metabolizer of a number of drugs, such as bupropion, cyclophosphamide, ifosfamide, pethidine, efavirenz, nevirapine, mirtazapine, ketamine, rifampicin, Phenobarbital, phenytoin, carbamazepine, and propofol. It is also a metabolizer of curcumin (from turmeric).

Genes & Pharmacy 3

CYP 2C19: Cytochrome P450, Family 2, subfamily C, Polypeptide 19:
Phase I liver detoxification.)

2C19
Metabolizes: **PPIs (used to treat stomach acid), antiepileptic drugs like valproic acid, antiplatelet drugs like Plavix, omeprazole, antimalarials, diazepam, steroids like progesterone.**
Inhibited by: Moclobemide, Fluvoxamine, Fluoxetine, Fluvoxamine (SSRIs), Chloramphenicol, anticonvulsants (weak) and anthocyanin's in berries (moderate activity).
Induced by: Rifampicin, artemisinin (from wormwood), carbazepine, norethisterone (BCP), prednisone, aspirin, St. John's Wort, dexamethasone.
Women using oral contraceptives have reduced activity.

Gene variations:
Associated with compromised detoxification and increased toxic load with widespread effects throughout the body. Poor removal of estrogen increases the risk of estrogen-associated cancers such as breast cancer. This one acts on 5-10% of drugs in clinical use including antidepressants, barbiturates, proton pump inhibitors, antimalarial and antitumor drugs.

Genes & Pharmacy 4

CYP 2C9: Cytochrome P 450:
Phase I detoxification.
2C9:
Due to poor metabolism, adverse drug reactions can be a problem.
Induced by: Rifampicin, Secobarbital, aprepitant, Phenobarbital, St John's Wort (weak), Benton.
Inhibitors: Fluconazole, miconazole, Amentoflavone (from Ginkgo biloba and St Johns Wort), Sulfaphenazole, valproic acid, apigenin, Fluvoxamine, Miconazole, metronidazole (Flagyl)

Gene variations:
CYP2C9 is an important gene/enzyme for oxidation of both environmental toxins and endogenous compounds.
At least 100 drugs are metabolized:
* warfarin, phenytoin, acenocoumarol, tolbutamide, losartan, glipizide, NSAID analgesics, **sildenafil**, ketamine, fluoxetine, tamoxifen, amitriptyline, Valproic acid, sulfaphenazole, etc.
Endogenous compounds:
* Arachidonic acid, 5-hydroxytyptamine, linoleic acid.
Herbs:
Ginkgo biloba and St. John's Wort.

Genes & Pharmacy 5

CYP 2D6: Cytochrome P 450:
Phase I detoxification.
2D6: Primarily functions in the liver and central nervous system.
Clears insecticides and herbicides.
2D6 acts on 25% of prescription drugs including SSRI, tricyclic-antidepressants, beta-blockers, opiates, neuroleptics, antiarrhythmics and various toxic plant substances. Note these drugs include Prozac, Zoloft, Paxil, Effexor, Wellbutrin, hydrocodone, amitriptyline, Claritin ametoprolol, Tagamet.
Inhibitors: Bupropion (Wellbutrin), Fluoxetine (Prozac), Metoclopramide (Reglan), Quinidine, Cinacalcet, Dronedarone, Duloxetine (Cymbalta), Mirabegron, Terbinafine.
Inducers: Dexamethasone, Rifampicin, Glutethimide (strong)

Gene variations:
Associated with compromised detoxification and increased toxic load with widespread effects throughout the body. Poor removal of estrogen increases the risk of estrogen-associated cancers such as breast cancer.

Genetics & Pharmacy 5

CYP 3A4: Cytochrome P 450:
Phase I detoxification.
3A4:
40-50% of pharmaceutical drugs metabolized by this enzyme. **Also xenobiotics, aflatoxin and food mutagens.**
This gene/enzymes is **not active in the fetus** but increases in activity with age. It is found in the liver and intestines where it plays an important role in drug metabolism.

Gene variations:
Research has shown this enzyme to be **inhibited by grapefruit, noni and pomegranate juice**, thus increasing bioavailability of certain drugs such as astemizole, terfenadine several immunosuppressants, some anti-depressants, antipsychotics, analgesics, statins, calcium channel blockers, sex hormones, H-1 receptor antagonists, caffeine, cocaine, hydrocortisone, dexamethasone, erythromycin, fluconazole, and many chemotherapeutic agents.
Intermittent ingestion of these juices can result in wide ranging blood levels of these substances.
Linked to estrogen-related cancers. **In presence of caffeine, this gene variation can increase estrogen by up to 70%.**
Increased drug interactions.

Genes & Pharmacy 6

G6PD: Glucose-6-Phosphate Dehydrogenase:
An enzyme for breaking down carbohydrates. Helps with the recycling of glutathione, an antioxidant.

Gene Variations:
A very common variation affecting perhaps 4 in 10 people. More common in males.
Increased incidence of miscarriage.
G6PD deficiency is associated with low levels of reduced glutathione and hemolytic anemia (a condition in which the red blood cells breakdown when stressed)
These variation my also cause interactions with ***fluoroquinolones and antimalarial drugs (Floxies***). These drugs also further oxidize glutathione.
Connected to **Mefloquine/Gulf War Syndrome** and Ehlers Danlos Syndrome (EDS)

Genes & Pharmacy 7

SULT: Phase II Detoxification

- Sulfonate simple phenols including phenol, catecholamines, thyroid hormone, environmental toxins, estrogen, pregnenolone, DHEA, and other neuro-steroids.
- Cofactor: Require 3-phosphoadenosine 5-phosphosulfate (PAPS), **sulfate** and energy for its production.
  - Vitamin D regulates the sodium-sulfate co-transporter
  - Require sulfur, so prolonged **low-sulfur diet** are problematic.
- SULT is inhibited by:
  - Acetaminophen, salicylic acid, aspirin, naproxen (Aleve), Quinolones (Cipro and related antibiotics)
  - Environmental chemicals (PCB, PAH, Triclosan, BPA.
  - Dietary: Catechins, food coloring, flavonoids, phytoestrogens.

Genes & Organophosphates

PON1: Proteasome 1 protein:
Hydrolyzes organophosphate insecticides and nerve gasses.

PON1Q192R: Hydrolyzes the toxic metabolites of a variety of organophosphorus insecticides.

Gene Variations:
Potential involvement in cancers, vascular disease, and psoriasis. May be connected to ALS. PON + exposure to organophosphates in early childhood has been found associated with reduced cognitive development, particularly perceptual reasoning.

Advantage of Multi-Appointment

- Less overwhelming
  - Lack of knowledge
  - Incorrect information
- Foreign philosophy/treatments requiring lifestyle changes
- Long appointments = less retention > less compliance.
- Monitor results
- Questions

How many appointments?

- Multiple factors
  - Number and type of health concerns
  - Complexity of genetic issues.
  - Lifestyle issues
  - Compliance
  - Response
- 3-4 minimum.
- Maximum? As many as 20 over a two or three-year period with yearly follow-ups after that.

Appointment Overview and conclusion 1

- Personalize a plan for your patient
  - Not the labs, rather the individual.
  - Genes are potential. Patient is the expression.
  - Gene variations are irrelevant until they're turned on and most will never be turned on.
- Flatten the learning curve
  - Basic genetics
  - Vocabulary of SNPs

Appointment Overview and conclusion 2

- Match genes to health conditions/physical/labs
- Prioritize: Resist becoming lost in treating their entire genome.
- Test to confirm/eliminate.

Treatment Conclusion

- You know the treatments
  - Organize them by *DNA*
- Genetics helps you focus them.
- Modify the treatment based on changes in how the patient feels, physical exam, and lab tests.

Sceintific Natural Medicine

Genetics supports our medicine

- Embrace it
- Teach it
- Use it

MD vs ND Medicine

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