Technologies & Discoveries Driving Personalized Nutrition



Francine Schoenwetter
New Hope Network



Tom AartsNutrition Business Journal



Roberta Kline MD
Genoma International









Personalized Nutrition Market Overview

THOMAS AARTS, CO-FOUNDER, NUTRITION BUSINESS JOURNAL

TOM@NUTRITIONADVISORS.COM

My Personalized Experience

1. Gene Testing

- 23andMe
- Sequencing.com (full genome)

2. Toxicity Testing

- Quicksilver
- Great Plains Labs: Ubiome

3. Hormone Testing

Dutch Test

4. Microbiome Testing

- Vibrant Labs
- Diagnostic Solutions
- Biohacker Collective

5. General Testing

- Singulex Labs (Heart)
- Cleveland Heart CORUS (Heart)
- Vantari Genetics

6. Food Sensitivity

- Cyrex Labs
- Vibrant Labs

My Personalized Experience



23andMe

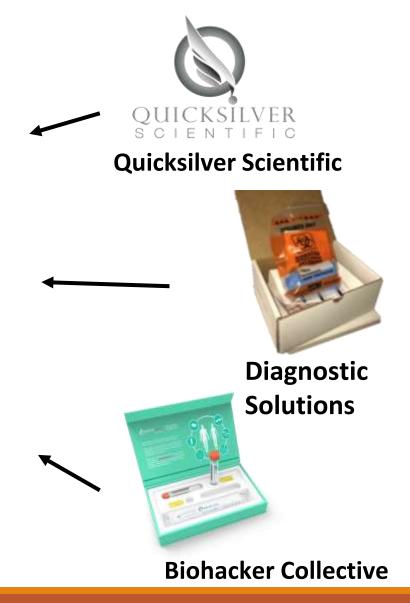


Vibrant Labs





- 40+ vials of blood
- Saliva, stool & urine samples
- 200+ pages of reports



My Personalized Experience

NutraHacker Selected Gene Results from 23andMe

	RSID	Gene	Expected	Genotype: Risk	Genotype Freq	Gene Function	Consequences	Encourage	Avoid	
Detoxification	rs2606345	CYP1A1	С	AC: 1/2	44.4935%	Phase I xenobiotic metabolism,	Reduced function of enzyme,	Diindolylmethane		
						PAH's, metabolize E2 to	effects vary with race			
						2-hydroxyestradiol				
Detoxification Detoxification	rs72547513	CYP1A2	С	AA: 2/2	N/A	Hydroxylation or dealkylation of	CYP1A2*11 allele with	Induce with broccoli,	Curcumin, Cumin,	
						xenobiotics, Phase I, metabolize	approximately 5% activity of that	Cabbage,	Grapefruit	
						E2 to 2-hydroxyestradiol	of the CYP1A2 wild type	Diindolylmethane,		
								Glucarate, NAC,		
								Cardamom,	L	
		Reduced Methylation capacity pathway for Vitamin B, so								
etoxilication	Kea	ucec	a IVIE	ethylati	ion cap	pacity pathw	ay for Vitam	iin B, so	Substrates of this enzyme	
Detoxification	٦,									
	I ne	I need to take methyl folate (MTFHR) instead of other								
	£	forms = -f \ /:+= : D								
			forms of Vitamin B							
	10111	1S 01	T VITA	amın B						
	10111	15 01	VITA	amın B		T.	common form of Vitamin E in a	I		
	IOIII	15 01	VITA	amın B			common form of ∨itamin ∈ in a North American diet) while those			
	IOITI	15 01	VITA	amin B						
etoxification	rs1041983	NAT2	VIT	amin B	N/A	This gene encodes an enzyme	North American diet) while those	NAC, Vitamin B2,		
Detoxification						This gene encodes an enzyme that functions to both activate and	North American diet) while those with GG saw a decrease.	NAC, Vitamin B2, Vitamin B3, Vitamin		
Detoxification							North American diet) while those with GG saw a decrease.			
Detoxification						that functions to both activate and	North American diet) while those with GG saw a decrease.	Vitamin B3, Vitamin		
						that functions to both activate and deactivate arylamine and	North American diet) while those with GG saw a decrease.	Vitamin B3, Vitamin		
	rs1041983	NAT2	С	CT: 1/2	N/A	that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens.	North American diet) while those with GG saw a decrease. Decreased activity	Vitamin B3, Vitamin B5, Molybdenum		
	rs1041983	NAT2	С	CT: 1/2	N/A	that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens. This gene encodes an enzyme	North American diet) while those with GG saw a decrease. Decreased activity	Vitamin B3, Vitamin B5, Molybdenum NAC, Vitamin B2,		
	rs1041983	NAT2	С	CT: 1/2	N/A	that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens. This gene encodes an enzyme that functions to both activate and	North American diet) while those with GG saw a decrease. Decreased activity	Vitamin B3, Vitamin B5, Molybdenum NAC, Vitamin B2, Vitamin B3, Vitamin		
Detoxification	rs1041983	NAT2	С	CT: 1/2	N/A	that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens. This gene encodes an enzyme that functions to both activate and deactivate arylamine and	North American diet) while those with GG saw a decrease. Decreased activity	Vitamin B3, Vitamin B5, Molybdenum NAC, Vitamin B2, Vitamin B3, Vitamin		
Detoxification Detoxification Detoxification	rs1041983 rs1208	NAT2	C	CT: 1/2 AG: 1/2	N/A 47.2515%	that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens. This gene encodes an enzyme that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens.	North American diet) while those with GG saw a decrease. Decreased activity Fast metabolizer	Vitamin B3, Vitamin B5, Molybdenum NAC, Vitamin B2, Vitamin B3, Vitamin B5, Molybdenum		
Detoxification	rs1041983 rs1208	NAT2	C	CT: 1/2 AG: 1/2	N/A 47.2515%	that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens. This gene encodes an enzyme that functions to both activate and deactivate arylamine and hydrazine drugs and carcinogens. This gene encodes an enzyme	North American diet) while those with GG saw a decrease. Decreased activity Fast metabolizer	Vitamin B3, Vitamin B5, Molybdenum NAC, Vitamin B2, Vitamin B3, Vitamin B5, Molybdenum NAC, Vitamin B2,		

Personalized Nutrition is Coming to a Theater Near Us

What is Personalized Nutrition 2.0?

1.0 Yesterday: Shakes and a Scale with a story about personalization (e.g. customized programs and products)



2.0 <u>Today</u>: Engineered foods and customized supplements with a saliva, urine, skin, cheek-swab, blood-spot or skin test



3.0 <u>Tomorrow</u>: Real-time, wearable and non-wearable diagnostic and consumer (in-home) monitoring technologies with graphical display of nutrients and biomarkers













Personalization 2.0 making a splash during the Olympics

Apple ad promotes how consumer testimonials on how the Apple Watch saved his life

Video: https://www.ispot.tv/ad/wFGF/apple-watch-dear-apple







Ancestry.com ad features the 1980 "Miracle on Ice" team and how their ancestors "come from everywhere"

 https://www.youtube.com/watch?time_continue=1 8&v=ALUxVEtLm5E

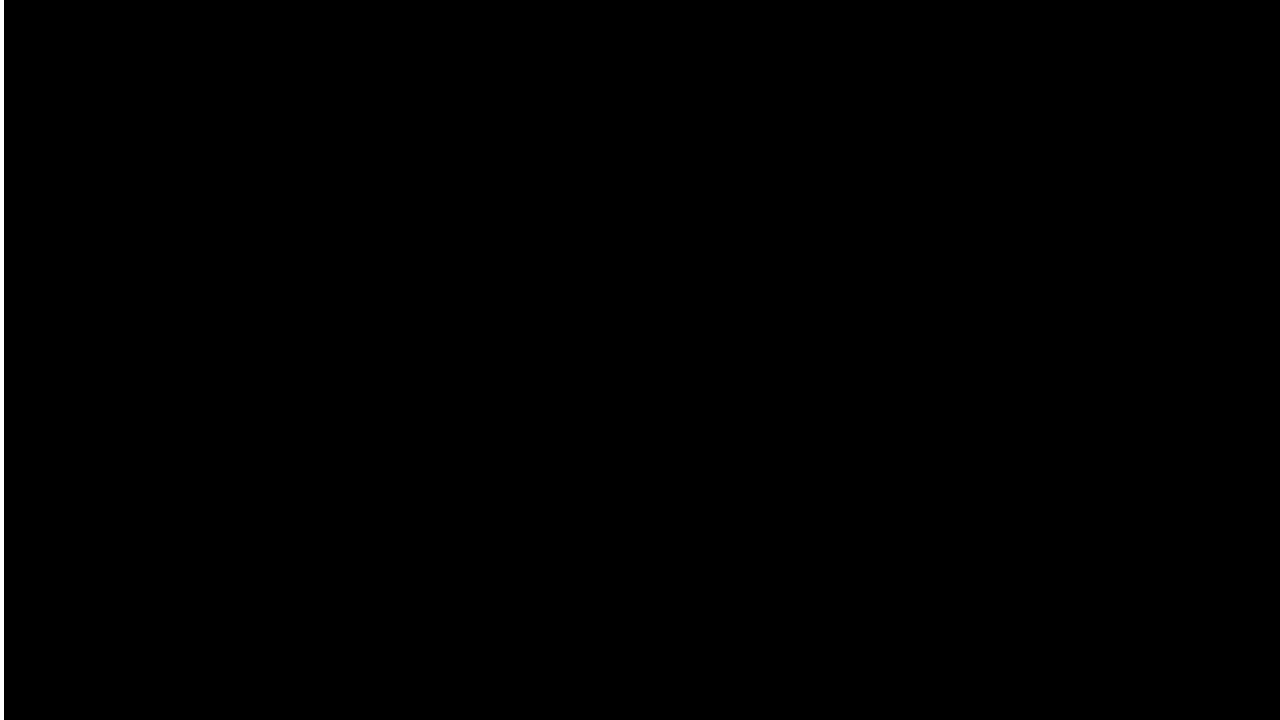


23andme Olympic add "DNA of a Skater" features Tara Lipinski

 https://www.ispot.tv/ad/wm85/23andme-dna-of-askater-featuring-tara-lipinski

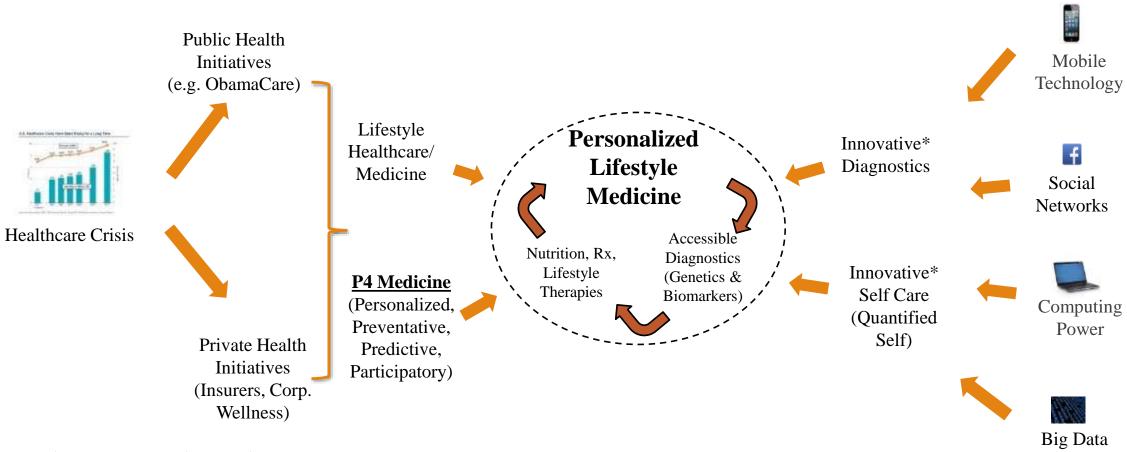
habit sold to the second secon

Personalization: Habit Video



The Future of Healthcare & Nutrition

Driven by Paradigm Shifts in Medicine & Technology



*Innovative = Simpler, Faster, Better, Real Time Products & Services

Sources: PLMI, Eric Topol, G. Ferrier

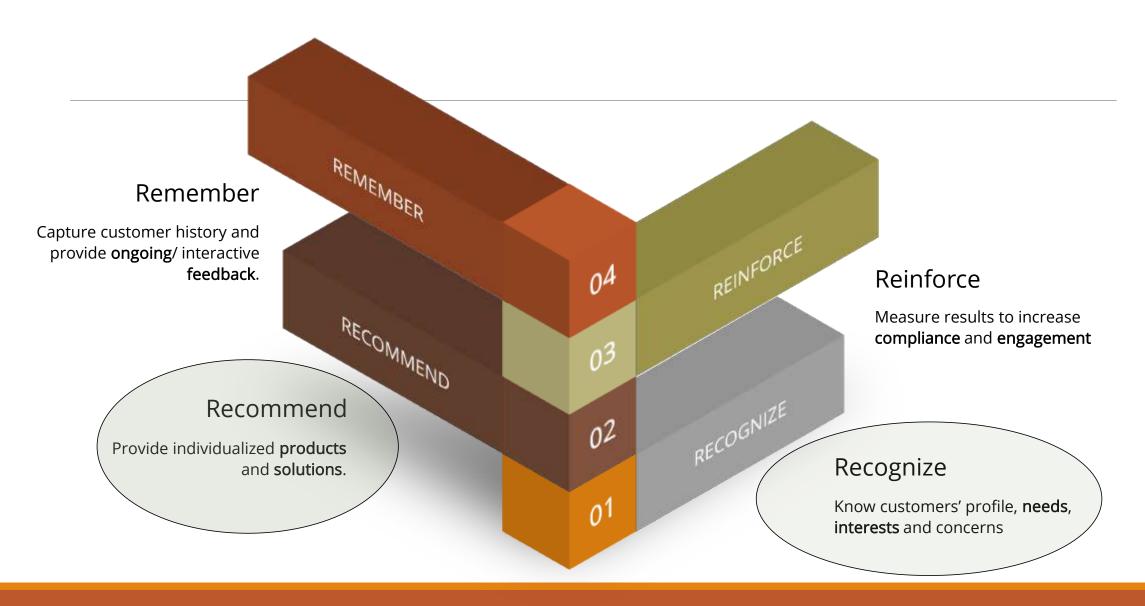
NBJ Editorial:

Supplements and Nutrition Companies Can Win in a World of Personalized Medicine



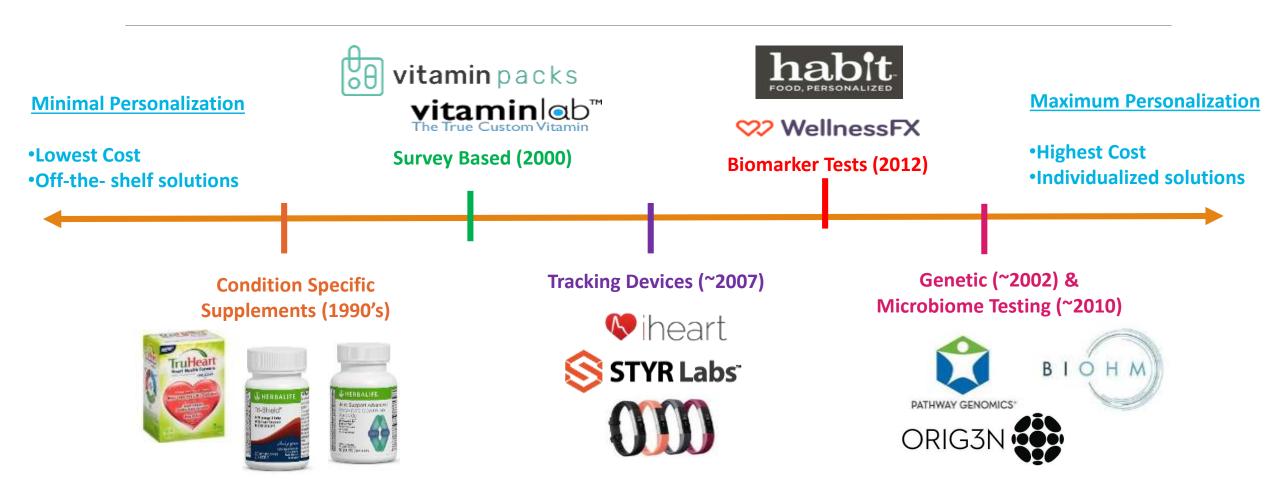
- 1. We're headed from the age of the average to the age of the individual.
- 2. The companies that can provide simple and user friendly diagnostics to measure an individual's biomarkers, and then deliver a nutraceutical product that can positively impact these metrics, will have the advantage in the age of personalized lifestyle medicine.
- The \$100 million supplement company of tomorrow may not even be a supplement company, but rather a diagnostics company that creates or effectively partners with a product line.
- 4. The diagnostics arm of personalized medicine also provides an important opportunity for our industry to prove to doctors and consumers, as well as our critics that our products really do work.

4 R's of Personalization 2.0 for the Consumer



Personalized Nutrition: Current Landscape & Companies

Landscape Spectrum for Personalized Nutrition



Survey-Based Nutrition Companies





ELYSIUM

































Survey-Based Personalization – Consumer Takeaways

Consumer Feedback and Observations*

- These recommendations seem pretty generic just tell everyone to take a multi & some fish oil
- Personalized health goals vaguely addressed I'm worried about heart health, but recommendations seem to be around gut health
- Limited supplements available I take lutein. Why isn't that even offered?
- My current supplementation isn't addressed Why don't they ask what I'm taking already and address how that is already helping me or not?
- Number of pills & delivery formats I don't take pills well. Why can't I do a powder or chewable? Do I
 really need to try to take 10 pills a day?
- Pricing assumes high end customers \$100 a month sounds like a lot. Will I even see a difference?

^{*} From Carla who was a consumer for all the survey companies from January through February, 2018

Vitamin Packs



www.vitaminpacks.com

Company Overview

• Provides foundational supplements & personalized vitamin packs



I ask this to be sure your supplements don't interfere with your diet preferences.

Pros

- Single, clear user interface for survey
- "Sage Advice" to explain why some questions are being asked
- Survey considers current health issues and medications
- Information on why supplements were recommended and how many supplements you'll be taking
- Ability to chat with a nutritionist for additional advice

Cons

- Survey is fairly long with 40 questions (but goes quickly)
- No family history or primary health concerns questions
- No way to delete individual supplements from a support group or to add to supplements selected (no listing of what supplement they offer overall)
- No way to get deeper personalized recommendations
- Monthly cost over \$100 (Initial 50% discount makes that first purchase look more inviting)

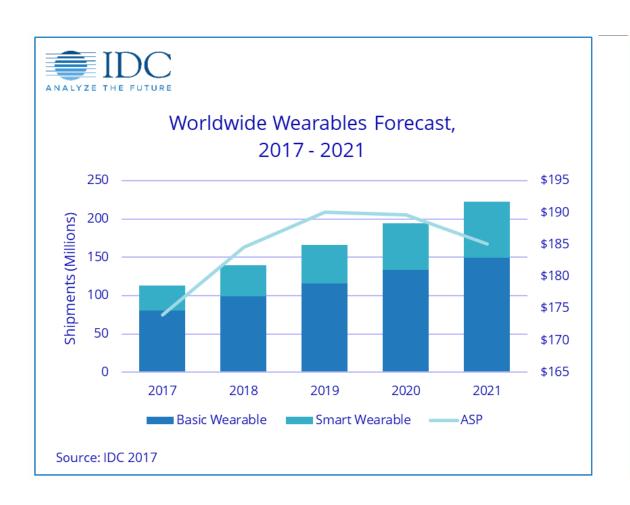


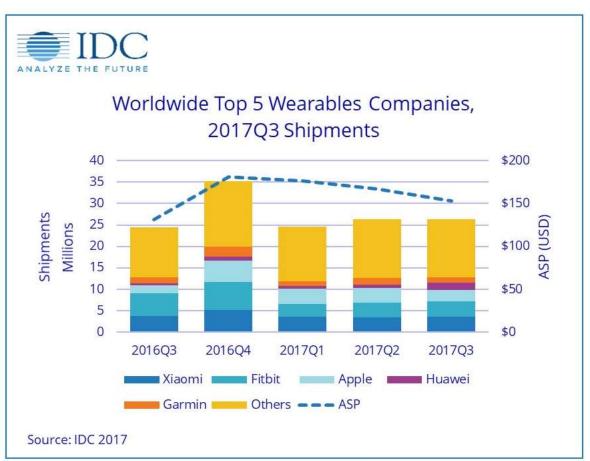
Source: www.vitaminpacks.com 17

Wearables and Tracking Devices

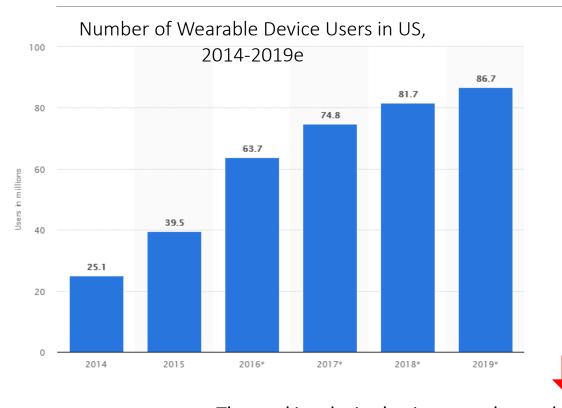


Worldwide Wearables Forecast, 2017-2021





Tracking devices targeting fitness have proliferated, but are moving to deeper health measures



- Fitbit Inc. reported just over \$1B in sales for the first 9 months of 2017, a
 22% decline due to decreased unit sales
- •Garmin's fitness division reported \$486M in sales for first 9 months of 2017, an **11% decline**







GARMIN

The tracking device business can have a huge initial upside, & few nutrition focused devices are currently on the market, but downswings are inevitable if revenue is dependent on devices rather than ongoing services and engagement tools

Fitbit invested \$6 million in glucose monitoring company Sano & is acquiring Twine Health's health coaching platform

Sano's glucose monitoring system is still in development.

- Minimally invasive skin patch
- Fitbit CEO James Park told CNBC that the investment "is in line with the company's broader strategy of developing health solutions, and not just devices."

Twine Health's coaching platform targets workforce health programs

- Current workforce health partners include Provant, Activate Healthcare, Wellness Coaches, & others
- According to Fitbit's press release, the acquisition "lays the foundation to expand its offerings to health plans, health systems and self-insured employers, while creating opportunities to increase subscription-based revenue."









twinehealth



www.twinehealth.com

Many of the Companies Developing Personalized Nutrition Tracking Devices are Still in the Developmental Phase- **Future**

New Companies continue to enter the market, offering devices in multiple formats, including:

- Bracelet
- Ring
- Scale
- Fingertip monitor (skin sensors)
- Thermometer
- Advanced Blood Spot Devices
 - ➤ Drawbridge Health



Biomarker Tests













Diagnostic





















More & more companies are offering consumers the ability to direct order biomarker test kits

- Traditional medical labs are offering consumer ordering via lab blood draws and some home test kits
- Many companies are offering biomarker test kits, with simple saliva or blood spot samples, that are clearly consumer targeted with packaging and marketing
- •Trends and disruption with blood spot testing You can get more from a blood spot

Vitamin D Test





Omega 3 Test





NO Test





- Companies like VitaminLab & Wellnicity offer comprehensive testing paired with comprehensive supplement offerings
- •Companies with targeted products lines, like omegas or Vitamin D, offer focused test kits that promote use of their product
- Berkeley Life and HumanN are examples of provide simple test strips for NO levels in addition to supplements to encourage future purchase and health tracking



Consumers are interested in price-efficient, easy testing that doesn't require a doctor visit

Wellmetrix



Company Overview

Provider of in-home urine tests for oxidation and inflammation

Pros

- Oxidative stress test for anti-aging and general wellness
- Uses patented system for calibrating results
- Includes phone app software for interpretation
- Patented hygienic collection device

Cons

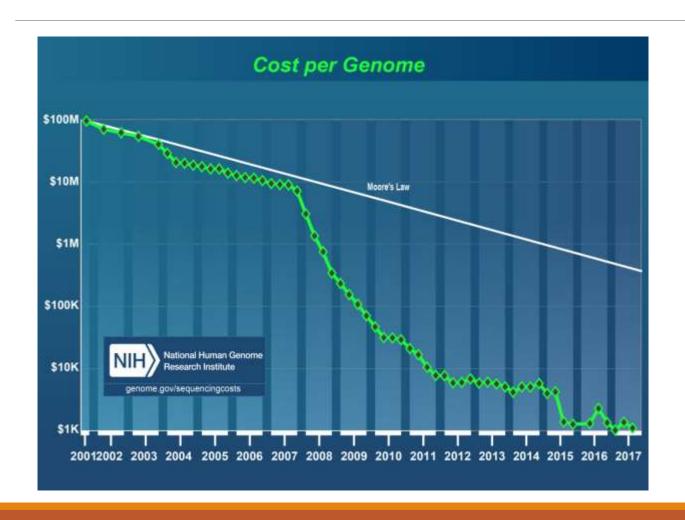
- Non-invasive but may be uncomfortable for some users
- Pre-revenue



Genetic and Microbiome Testing



Moore's Law related to Genome Testing

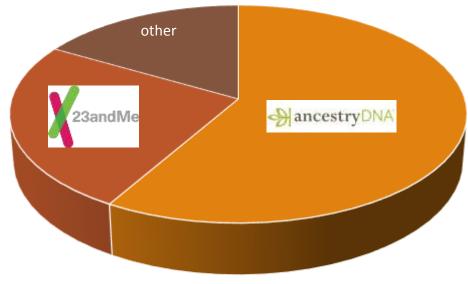


Conclusion:

In the next 5 years, consumers will have access to their genomes for under \$1,000 (today: \$3,000).

Genetyping Market

- Direct-to-consumer genetic tests more than doubled during 2017 and now exceeds 12 million, mostly in the U.S.
- Ancestry.com has tested more than seven million people, including two million during the last four months of 2017
- The second-largest player, 23andMe, has tested more than three million, followed by MyHeritage and FamilyTreeDNA.
- Equates to around 1 in 25 Americans
- Real goal is Big Data and research partnerships
- Medical community and FDA consider them as "recreational" or "vanity" tests
- Creating a burgeoning secondary market for reanalyzing/ interpreting results



Genetic test services are experiencing tremendous consumer interest

Estimated 7 million Americans have purchased DNA test kits

- DTC genetic testing market expected to grow from about \$70 million in 2015 to \$340 million by 2022, according to a report from Credence Research
- •23andMe reported to have raised close to \$200 million in mid-2017 on a **\$1.5B** pre-money valuation. More than 2M customers in mid-2017



needs

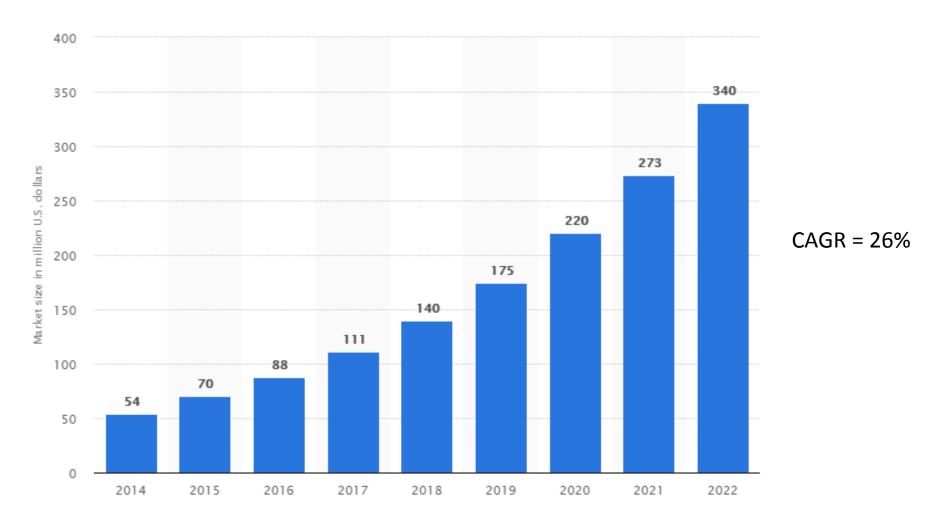


- AncestryDNA reported 4M customers in database in April 2017, and sold 1.5M test kits on Black Friday 2017 - largely on Amazon for \$54.99 (reported on Wired.com)
- Ancestry.com announced in Sept. 2017 that it was delaying a planned public offering. DNA test revenues for 1H2016 were \$93M.



The genetic testing business is currently experiencing a huge surge in consumer business, boosted by lowered pricing. Supplement companies can use these 1-time tests to assist consumers in identifying base supplement

Global DTC Genetic Testing Market, 2014-2022



30

Orig3n



www.orig3n.com

Company Overview

 DNA testing service with test kits associated to health goals

Pros

- •Kits profile different genes depending on goals
- •Test kits priced from \$29 to \$149 to profile from 1 to 27 genes
- •Simple in-home cheek swab test kit
- •No comprehensive whole-body whole-gene test kit

Cons

•New test required for each kit







Source: www.orig3n.com

ORIG3N DNA Test



NUTRITION Report

Personalized for: Thomas Aarts

Your profile includes insights into the following categories:

Food Sensitivity

Food Breakdown

Hunger and Weight

Vitamins



HUNGER AND WEIGHT

Are you more or less likely to feel full after a meal? Learn what your genes say about your metabolic rate, appetite, or sugar cravings, all major determinants of weight gain or loss.

Genes in this category:

FTO SLC2A2 ADIPOQ DRD2 LEPR MC4R NMB

Gene		Your Result
MC4R	Obesity	TT

People with CC:

You are rare with this variant as it is found in only 5% of the population. With this type, it is more likely that you are at risk of obesity. It is recommended to work with a Registered Dietitian Nutritionist that can create a nutrition plan for you based on nutrient dense foods to meet your personal needs for a healthy weight.

People with CT:

This variant is found in 40% of the population. Similar to CC, you are more likely to have a risk for obesity. It is recommended to work with a Registered Dietitian Nutritionist that can create a nutrition plan for you based on nutrient dense foods to meet your personal needs for a healthy weight.

People with TT:

The TT type is found in 55% of the population and is not associated with a tendency to gain weight and have a higher BMI. It is still recommended to eat a balanced diet and regularly exercise to lead a healthy lifestyle and decrease risk of chronic diseases.

Comments

Analysis of this gene can reveal if an individual is likely to have increased waist size, increased BMI (body mass index), and a higher incidence of insulin resistance. Mutations in this gene have been found to have the strongest association with childhood and adult obesity.

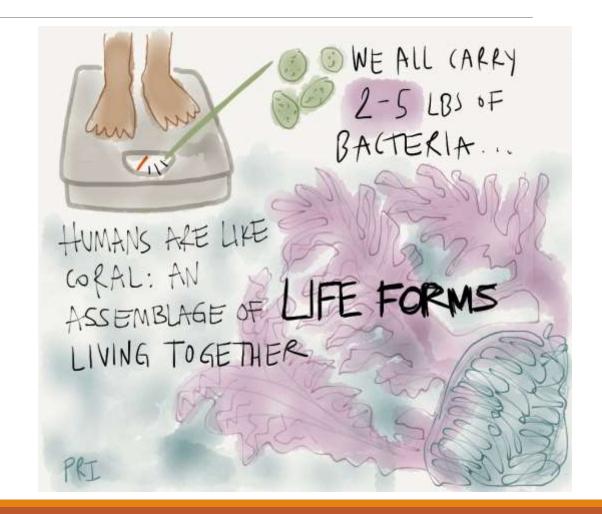
Microbiome Relevance

"... the microbiome provides

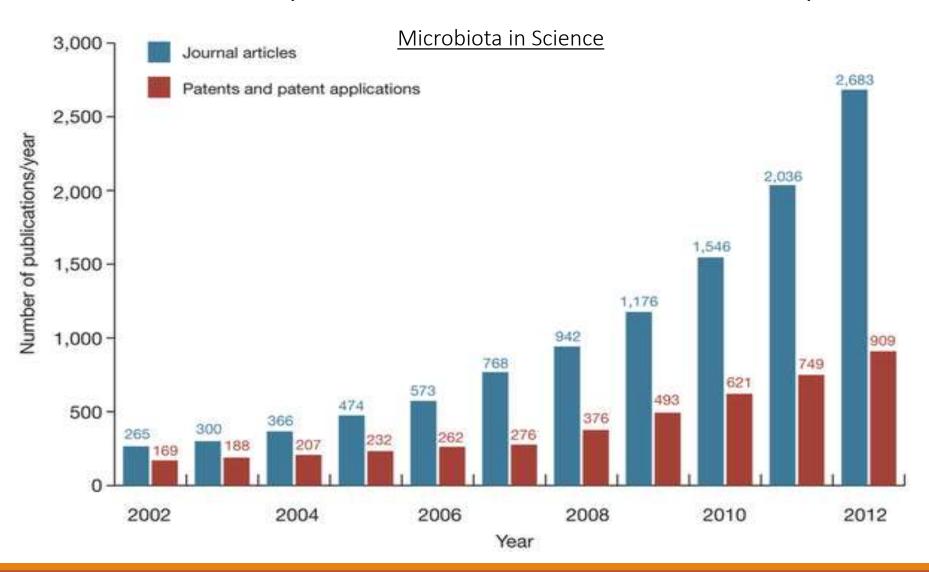
more genes that contribute to human survival than the human genome itself provides."

> 3 million genes vs. 22,000

Source: NIH Health Matters, June, 2012 http://www.nih.gov/researchmatters/june2012/0625 2012microbiome.htm



Science Activity Growth In Microbiome Is Exponential



34

Personalized Nutrition & The Microbiome

- The growth in interest and science around the microbiome has provided another platform for personalized nutrition that will be disruptive
- Companies like Ubiome in 2010, Viome in 2014 and Biohm in 2015 have offered reasonable microbiome tests with mixed quality on the interpretation and results











Viome

'' IOME

www. viome.com

Company Overview

 Microbiome company focused on improved health via probiotics & prebiotics

Pros

- •Two-part tests uses stool sample to analyze gut health and a nutritional shake to measure metabolism
- Annual subscription plan allows consumer to see YOY changes

Cons

- Single product
- •Fecal samples aren't fun to collect
- •At \$399, test kits isn't cheap



You have 20,000 genes. Your 40 trillion friends have 800,000 genes!

How unique are you?
DNA: 99% commonality
Microbiome: only 5% commonality

You and your 40 trillion microbial friends deserve personalized nutrition!

Source: www.viomehealth.com 36

Thomas Aarts

Co-Founder Nutrition Business Journal, Managing Director Nutrition Business Advisors

tom@nutritionadvisors.com

(858) 688-3152

Personalized Nutrition & Genomic Medicine:

The End of One Size Fits All

Roberta L. Kline MD, FACOG

The "Omics" Revolution

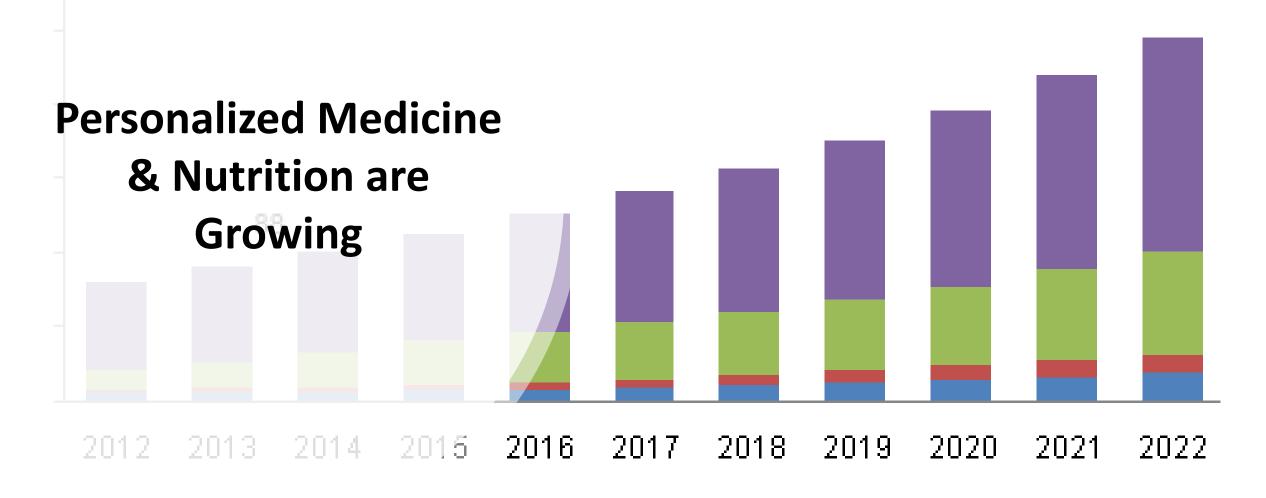
 Human Genome Project first proposed mid-1980's.

• Completion of the Human Genome Project in 2003.

 Human Genome contains 20,000-25,000 genes and 10 million SNPs.

• Over 1 million scientific articles related to genomics and health.

Source: www.genome.gov



- PM Diagnostics
- Personalized Medical Care

- PM Therapeutics
- Personalized Nutrition & Wellness

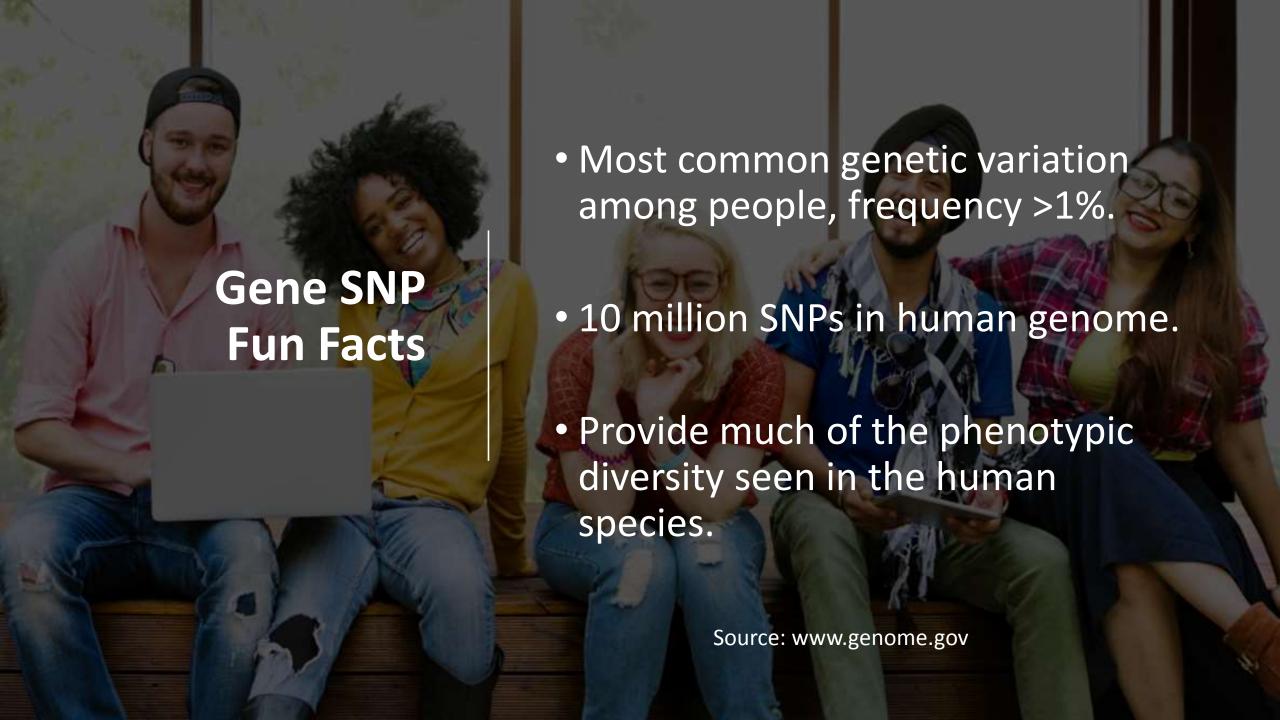


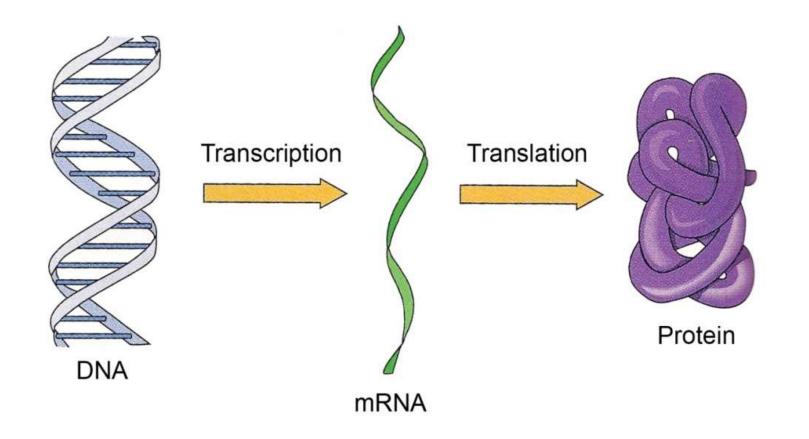


Definitions

Genetics vs Genomics:

- Genetics refers to mutations of varying sizes that are rare and cause loss of function, with a known impact/disease not modifiable by diet or lifestyle.
- Genomics refers to nucleotide polymorphisms that are common. Most of these polymorphisms are single nucleotide substitutions that are referred to as SNPs, and have a potential subtle but additive impact on health, modifiable by diet and lifestyle.

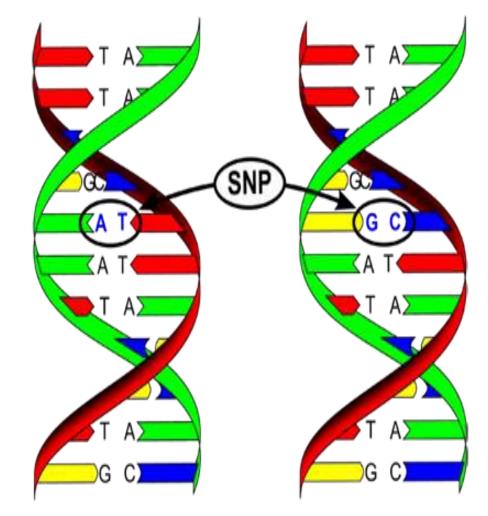


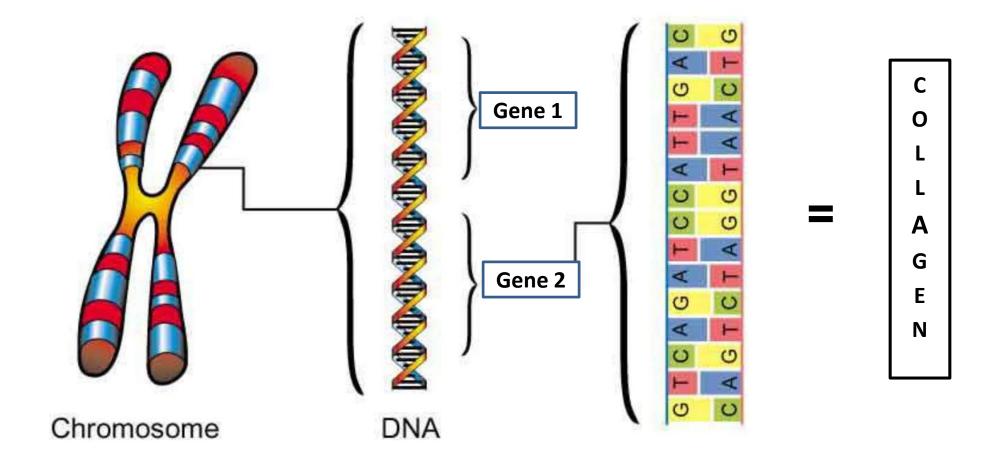


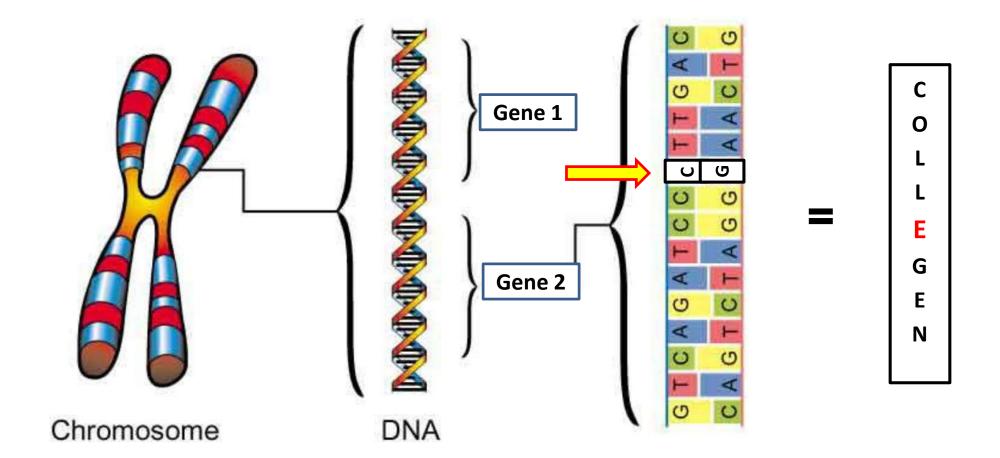
Genes Make Proteins

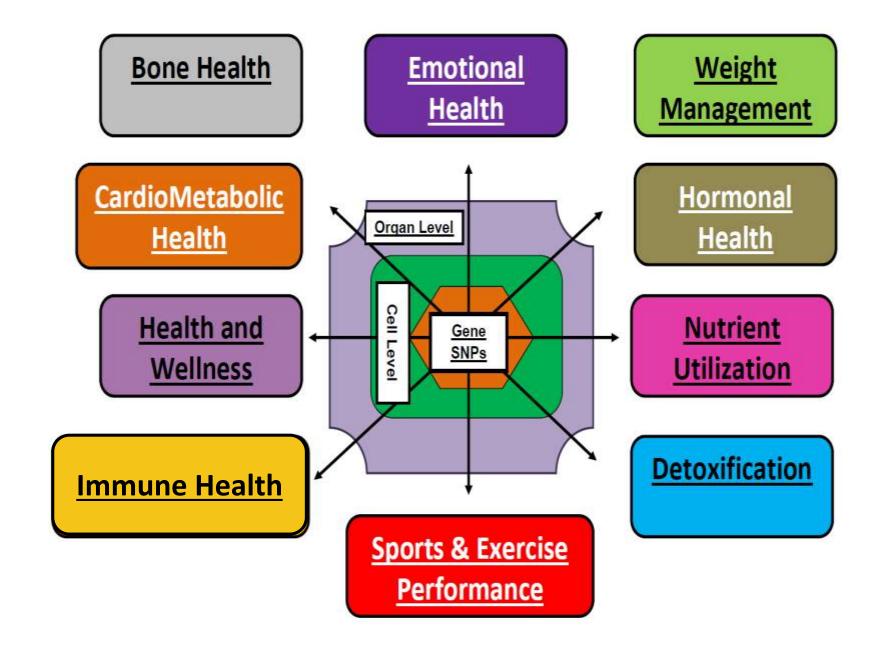
Spelling Error in DNA: Single Nucleotide Polymorphism (SNP)

- Typo in the DNA sequence.
- Single DNA building block (nucleotide) replaces another.
- SNPs occur throughout a person's DNA.
- Can be inherited or acquired.









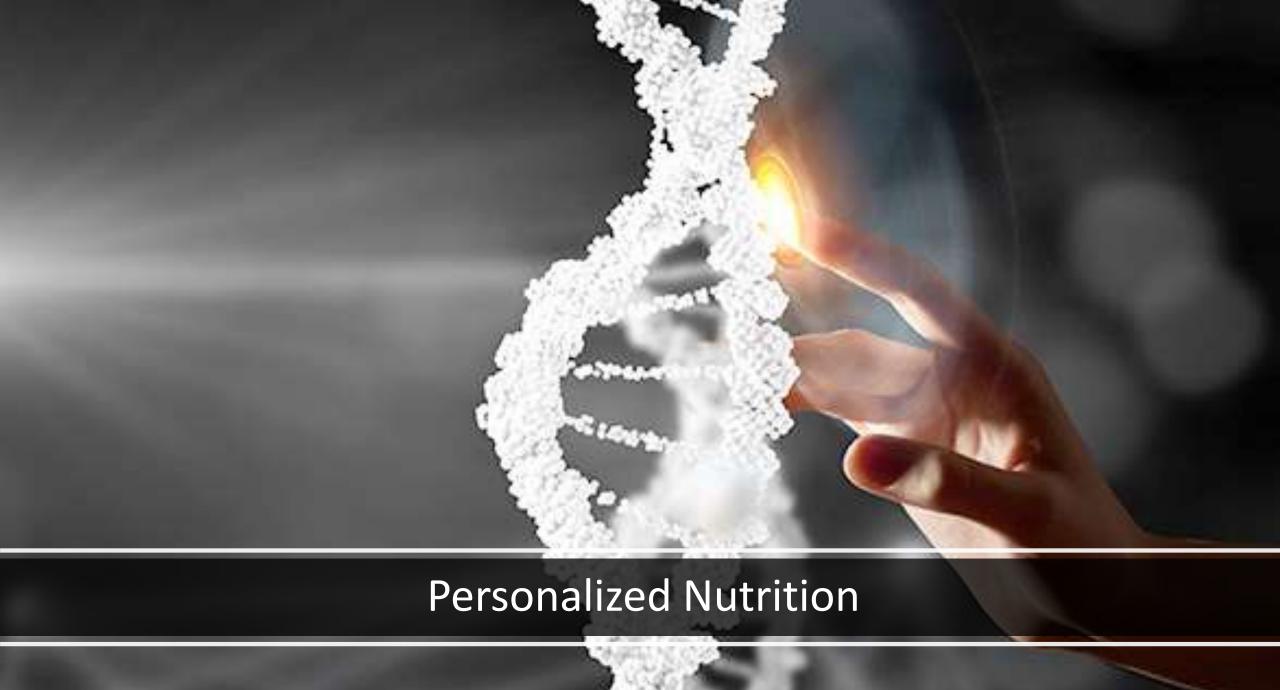


Nutritional Genomics: Food-Gene Conversation

Nutrigenetics: how genes affect utilization of nutrients and bioactive compounds.

Nutrigenomics: how dietary nutrients and bioactive compounds affect function of genes.









Unable to convert plant-based sources of omega 3 fatty acids to EPA and DHA.

Solution: Algae-based EPA/DHA supplement

Unable to convert sunlight into Vitamin D.

Solution: Vitamin D3/K emulsion supplement

Unable to convert beta carotene to vitamin A (retinol).

Solution: Retinyl palmitate supplement

Unable to convert ubiquinone to ubiquinol.

Solution: Ubiquinol supplement

Unable to efficiently methylate and transport folate into cells.

Solution: Methylfolate supplement







Too much estrogen going down the wrong funnel to create cancercausing metabolite 4-hydroxy estrone.

Solution: EPA/DHA, DIM-Pro supplements

Poor methylation of 4-hydroxy estrone.

Solution: S-adenosylmethionine, magnesium, B-complex vitamin supplements

Stress Management

Unable to efficiently neutralize free radicals.

Solution: Antioxidant supplement

(resveratrol, manganese, sulforaphane, vitamin C)



The Power of Insight

I am unique – with unique needs.

I see and accept who I am on the deepest level.

I feel empowered.

Resources

- www.genome.gov
- www.genomainternational.com
- www.todayspractitioner.com
- www.sciencedirect.com
- www.nature.com
- It's Not Just Your Genes! Ruth DeBusk

- International Society of Nutrigenetics and Nutrigenomics
- Journal of Nutrigenetics and Nutrigenomics
- Journal of Nutritional Biochemistry

drroberta@genomainternational.com